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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICE—

Twenty-fifth Annual Meeting, American Gas Light Assaciation... 401

Fifth Annual Meeting, Pacific Coast Gas Association—Official Report—Revised by the Secretary—Concluded from page 370..... 402

Second Day, Afternoon Session—The Question Box—Editors Named—Belated Questions—Adjourned.

Some Abstracts from a Review of Some Articles Printed in the "Journal fuer Gasbeleuchtung," by Mr. Frederick Egner..... 407

The Extending Use of Gas in Industrial Operations, by Mr. Frederick H. Shelton..... 408

The Evolution of Electric Lighting Fixtures, by Mr. R. M. Dyer... 410

A Difference in Hydraulic Mains, by Mr. P. Egan..... 412

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 413

Mr. Summers Takes Charge at Hackensack, N. J.—Contracts for the Logan Iron Works—Annual Meeting, Malden, Mass.—Proposed Sale of the Vancouver (B. C.) Works—Annual Meeting, Concord, N. H.—Mayor Todd and the Municipal Interest in the Louisville Company—Annual Meeting, Rockville, Conn.—To Build the Newport News (Va.) Works—Contract for the Berlin Iron Bridge Company—Consolidation at Salt Lake City—To Sell the Belongings of the Waukegan (Ills.) Proposed Company—Electric Schedule, Wilmington, N.C.—Something from St. Cloud, Minn.—A "Fixed Meter" at Butte, Montana—Betterments, at Springfield, Ohio—The International Standard Gas Mfg. Co.—And Other Items.

Diagonal Joints for Boilers..... 414

Profits of a Coal Tar Industry..... 415

The Market for Gas Securities..... 415

[OFFICIAL NOTICE.]

TWENTY-FIFTH ANNUAL MEETING, AMERICAN GAS LIGHT ASSOCIATION.

GENERAL ANNOUNCEMENT.

AMERICAN GAS LIGHT ASSOCIATION,
OFFICE OF THE SECRETARY,
MONTCLAIR, N. J., Sept. 13, 1897.

There will be an annual meeting of the American Gas Light Association held in Old Point Comfort, Va., on October 20, 21 and 22, 1897.

The meeting will be called to order by the President, Mr. Chas. H. Nettleton, of Derby, Conn., at 9:30 o'clock A.M., Wednesday, October 20, in the meeting hall of the Hotel Chamberlin, the headquarters.

The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in so doing a reply should be requested, for which a self-addressed, stamped envelope should be inclosed, as misunderstandings may thereby be averted.

The Chamberlin is conducted on the American plan, and the rates will be as follows: $3 per day for single room without bath; $4 for single room with bath; $3 for each person, in double room without bath; $4 for each person, in double room with bath.

The Hygeia Hotel, directly across the street from the Chamberlin, gives the same rates.

The meeting hall will be the dancing hall of the Hotel Chamberlin; thus the headquarters and the hall will be in the same building.

The Roll Call will be made by means of the door card system. Each member upon entering the hall for the first time will at the door receive a special card upon which he will find his name, address, etc., as it appears on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of Application for Membership accompanies this circular. More can be obtained of the Secretary.

Remember, all applications must be in the Secretary's hands by Oct. 10, at the very latest, otherwise they will not be acted upon at this meeting.

The list of papers to be read at this meeting is as follows:

"Some Further Experiments on Interior Illumination," by Mr. Alten S. Miller, Long Island City, N. Y.

"Chemical Notes on Purification," by Mr. Henry A. Mather, Brooklyn, N. Y.

"Gas Advertising," by Mr. R. M. Searle, Atlanta, Ga.

"A Report on Burner Stoppages," by Mr. Paul Doty, Long Branch, N. J.

A paper by Mr. K. M. Mitchell, St. Joseph, Mo., giving an account of a method successfully employed by him to obviate trouble from naphthaline.

A paper, the name of the author of which we are not yet at liberty to give.

In addition to the above there will be several topics brought in for discussion by short written introductions.

All questions for the Question Box should be sent in to the Secretary as soon as possible, in order that they may be printed in the next circular before the meeting, thereby insuring their discussion.

During the days of the meeting all announcements will be posted on the Bulletin Board in the meeting room. All members are warned to take notice thereof accordingly.

All members attending the meeting are particularly requested to wear their membership badges in plain sight, thereby greatly aiding the officers and the local committee in their work, by affording a ready means of recognition.

In order that the Year Book containing the report of this meeting may be published and issued to the members immediately after the meeting, notice is hereby given, that if any of the speakers at the meeting desire to correct their remarks in discussions before they are printed, they will be given an opportunity before leaving Old Point, but *not* after. The stenographer will have typewritten copy of the principal discussions prepared at the headquarters between the sessions of the meetings, and all those who desire to correct their remarks *must* notify the Secretary at the close of the session at which such remarks are made, as all the report will be turned in to the printer immediately after the adjournment of the meeting.

Special rates for transportation have been granted (viz., full fare going and one-third fare returning by the same route), by the several Passenger Associations named, and under the conditions noted.

The Trunk Line Passenger Committee, covering territory west of New England and east of Niagara Falls, Buffalo and Salamanca, N. Y.; Pittsburg, Pa.; Bellaire, Ohio; Wheeling, Parkersburg and Charleston, W. Va.

The New England Passenger Association, covering nearly all of the lines in the New England States.

The Southeastern Passenger Association, covering the territory south and west of the Virginias, and south and east of the Ohio and Mississippi Rivers.

The Central Passenger Committee, covering the following grounds: Bounded on the east, by Pittsburg, Salamanca, Buffalo and Toronto; on the north, by the line of and including points on the Grand Trunk Railway, from Toronto to Port Huron, thence via Lakes Huron and Michigan to the north line of Cook County, Illinois; on the west, by the west line of Cook County and the Illinois and Mississippi Rivers, to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis; and on the south by the Ohio River, including points on either side of that river.

The Western Passenger Association, covering the territory west of and not including Chicago, Peoria and St. Louis—in other words, the territory west of that of the Central Association—have refused to grant the rate. Members from this territory should buy tickets from starting point to the nearest or most convenient point in the territory of any of the Associations granting the reduced rate, and at such point purchase tickets through to Old Point Comfort and obtain a certificate.

The following extracts from the regulations of the railroads are cited for the information of the members. The special rates are granted subject to these regulations.

First.—The reduction is conditional on there being an attendance at the meeting of not less than 100 persons holding certificates.

Second.—Each person, to obtain the excursion rate, must purchase a first-class ticket (either limited or unlimited) to the place of meeting, for which he will pay regular fare, and upon request the ticket agent will issue a printed certificate of purchase of the standard form. Agents at all important stations are supplied with certificates.

Third.—If through tickets cannot be procured at the starting point, purchase short-trip ticket to the most convenient point where such through tickets can be obtained, and there purchase through to place of meeting, requesting a certificate from the ticket agent at the point where each purchase is made.

Fourth.—Tickets for the return journey will be sold by the ticket agent at the place of meeting at one-third the highest limited fare, only to those holding certificates signed by the ticket agent at point where through ticket to place of meeting was purchased, and countersigned by signature written in ink by the Secretary of the Association, certifying that the holder has been in regular attendance at the meeting.

Fifth.—No reduction of fare will be made on the return passage, if the going ticket is purchased more than three days before the opening date of the meeting; except that when meetings are held at distant points, to which the authorized limit is greater than three days, tickets may be purchased before the meeting in accordance with the limits shown in regular tariffs.

Sixth.—Certificates are not transferable, and return tickets secured upon certificates are not transferable. The transfer of any such is liable to prevent the securing of reduced rates for future meetings.

Seventh.—The certificate of agent at starting point, duly endorsed by Secretary of Association, must be presented to ticket agent at place of meeting, within three days (*Sunday* not reckoned, except by Southern Passenger Association), after adjournment of meeting. The return ticket will be for the line or lines covered by the going ticket.

Eighth.—No refund of fare will be made on account of any person failing to obtain a certificate.

The Old Dominion Steamship Company have also granted a round-trip fare of $10 from New York to Old Point. This includes stateroom and meals both ways.

SPECIAL.

Be sure to obtain a railroad certificate when buying your ticket for Old Point, as the greater the number of certificates handed in the easier it is to get the reduction in rates next year. Apply for ticket and certificate at least 30 minutes before train time. Each person must sign his own certificate at time of purchasing ticket for Old Point. Be sure to have the Secretary endorse your certificate at Old Point as soon as you get there. Apply for return ticket at least 30 minutes before train time, and have your certificate with you. Any person, ladies included, attending the meeting, is entitled to the reduced rate from the territories named. Members will please hand their certificates to the Secretary, or his clerk, upon arrival at place of meeting. If there are 100 members present, holding certificates, each certificate will then be properly endorsed and handed back to owner, before adjournment.

If a sufficient number of subscriptions are obtained there will be a banquet at the Hotel Chamberlin, Thursday evening, October 21, and an excursion on the waters of Hampton Roads and the James River, on Friday, October 22. Tickets admitting member to banquet and, with ladies accompanying him, to the excursion can be had for $5. If you wish to join in these entertainments please sign enclosed card and mail it to the Secretary at once. It will be necessary to have at least 100 subscriptions to make them successful.

ALFRED E. FORSTALL, Secretary.

Extracts from the Constitution.

SEC. 12. Application for Active Membership, or for Associate Membership, or for transfer from Associate to Active Membership, must be received by the Secretary at least ten days prior to the meeting at which the application is acted on.

SEC. 51. No member who owes two years dues shall be entitled to vote, or to participate in the deliberations of the Association, or to receive a copy of the proceedings.

SEC. 52. Any member whose dues shall remain unpaid for a term of three years, may be dropped from the roll of membership by a vote of the Council.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONCLUDED FROM PAGE 370.]

FIFTH ANNUAL MEETING, PACIFIC COAST GAS ASSOCIATION.

HELD AT SAN FRANCISCO, CAL., JULY 20, 21 AND 22, 1897.

SECOND DAY, AFTERNOON SESSION.

THE QUESTION BOX

The President—The next question is:

"What experience has been had with fiber pipe as a conveyer of gas?

Mr. Holberton—I would state that if anybody wants to see the practical part of the laying of fiber pipe, the block north of here on Sutter street is open and is laid with it.

Mr. Fish—If anyone will go about the city he will see the beginning of several miles of fiber pipe.

The President—The idea is not the introduction, but the life of the pipe as affected by heavy traffic.

Mr. Fish here read a printed circular relative to the manufacture of fiber pipe, after which he said: I have some samples of pipe that have been in use for several years which show no effect whatever from acids, gas or water, the pipe wherever used giving satisfaction. The only objection that I have ever heard is the ease with which it is punctured, especially by laborers who, being employed by other parties, have had no experience with and do not recognize this pipe when they strike it. The usual remedy is to place a cheap board or slab of redwood in the trench about 6 inches above the pipe as a warning to be careful; for the street crossings I have never yet heard of its being crushed when properly laid.

The President—Does it admit of the regular tamping that is ordinarily used in filling in?

Mr. Fish—Yes, sir.

The President—In laying gas or water pipe, as a general thing the filling in comes after the pipe is laid and is heavily tamped.

Mr. Fish—It will not, with ordinary care, be injured in the slightest degree.

The President—The only reason I make that suggestion is your statement about pressure.

Mr. Fish—If any member of this Association wants a sample length of pipe of any size I will be glad to send it to him at any address, free of expense.

The President—How do you connect services?

Mr. Fish—With an iron sleeve having an outlet of the size that you wish the service to be. The sleeve is put on and a hole bored through the opening of the sleeve into the pipe, into which is screwed the iron service. Fiber pipe can be connected with iron mains very readily by an iron sleeve and Portland cement. All fittings are supplied—tees, ells and crosses.

The President—Of iron or fiber?

Mr. Fish—Of fiber.

The President—Is the sleeve of iron or fiber?

Mr. Fish—The sleeve for connecting is of iron.

The President—

"Has any member had any experience in barring mains to discover leakage?"

Mr. Gregory—I suppose we have all had experience of that kind, and though we do not all use the same means, we all attain about the same end. Instead of using a steel bar we dig a hole at every joint. First we uncover a joint and then measure 12 feet, or whatever the length may be, and dig a post hole, not a wide hole, but one as narrow as possible. As soon as one gets down 6 or 8 inches into the ground any leakage will show, coloring the soil, especially if it has been standing for years. If we detect any leakage we re-caulk the joint.

The President—

"What benefit is derived from the use of tallow gaskets in the laying of cast iron pipe?"

Mr. Secretary, I believe you have an answer to that. It was assigned to Mr. E. P. Callender, of New York City.

The Secretary (reading)—"In times gone by the practice of using tallow gaskets, in the laying of cast iron gas pipes, was quite general. The advantages claimed for this method were, that any spaces or interstices in the lead joint due to cooling were filled with the tallow which was softened by the heat of the molten lead, and thus a joint impervious to external moisture was obtained; and also that the tallow offered a

favorable surface to which some of the condensable constituents of the gas could become attached, thus making a gas proof joint on the inside. The tendency in modern times is to reduce the number of operations or handlings in pipe laying, and since the introduction of jute, a good pipe layer can make a perfectly tight joint in less time without tallow; the jute packing sufficiently to almost make a satisfactory joint alone; the lead acting as a protector, and giving stiffness and stability. The tarred rigging of ships, which has been discarded, cut into suitable lengths untwisted and rerolled into a gasket, makes an excellent joint when caulked and topped with lead in the usual manner." I will state in substantiation of that, that all of the mains that have been laid in our company in the last 15 years have been laid in that way. We employ nothing else but the best of discarded ship rigging. We get about a 2½ inch rope, and then separate it into small bits, thoroughly separate it and re-wind it, and we have had no trouble at all with the joints of our mains. I don't think, excepting where the joint has been disturbed by settling, that we have ever had a leaky joint in our pipes.

The President—What is your experience in that line, Mr. Hollidge? I would like to hear from you.

Mr. Hollidge—I concur with what Mr. Britton has said. That has been my experience, and I have been in the gas business now for some 34 years, and that has been my practice from boyhood. Take the old ship's rigging, cut it up into different lengths and go about twice around the pipe; you can thus get better and tighter jointing than with oakum, or anything that has not tar on it, and it will stand. But I also find in laying mains in wet weather that it is very desirable to have a grease pot with you in the trench. Some people wholly discard the use of grease, but I am in favor of it in wet weather. Sometimes the wet will get in your joint and it will "blow" on you, and the consequence is that you will have a half joint on one side and no joint on the other. So I fully believe in carrying a grease pot in wet weather. But in dry weather it is unnecessary. But I positively do believe in old rigging. If you can't get it, get oakum.

The President—Speaking of tar, you don't lute it with vegetable tar; you refer to Stockholm tar?

Mr. Hollidge—Yes, sir.

The President—You say that is objectionable; the gas dissolves it, or has a tendency to dissolve it, has it?

Mr. Hollidge—No, sir. I have taken joints after they have been leaded 20 years, and yet the smell of tar remains.

The President—I misunderstood you; I thought you said tar was objectionable.

Mr. Hollidge—Oh, no; I find dry Manilla rope is a very good thing, but that tarred rope is better, and that not only that but it will form a soft paste in the joint by the tar running down the pipe and into the socket, but it will form a smooth basis for the lead to run on, and Stockholm tar is a great deal better for the lead to run on, as it melts it and forms a kind of grease, giving a better surface for the molten lead.

The President—In the matter of tar, did you disapprove of it?

Mr. Hollidge—I disapprove of it in dry weather, but I approve of it in wet weather, when there is any chance of water coming into your joints; sometimes it will blow on you and give you harder work; at other times it will run on both sides of the bottom, and leave the hole so you will have to block it up with a "dutchman." I believe in a good, solid joint.

Mr. Eichbaum—I want to say a word about the excellence of a chunk of tarred rope just for the mains; and, furthermore, I have seen that chunk taken out and relaid after 14 or 15 years, and it was apparently just as good as the day it was put in, and the little Stockholm tar that is in it makes it stick so that it jams. In fact, with joints under 4 or 5 inches pressure, we find no trouble at all in stopping the escape of gas, so we can go on and make the joint at our leisure.

The President—

"Which is preferable, force or suction, in cleaning service pipes?" Assigned to Mr. Fenner.

Mr. Eichbaum—I am going to simply state very briefly that force is preferable, for the simple reason that there are a large number of obstructions in street mains or services. The long riser pipe running up into the house naturally draws moisture. That creates rust, which falls down and lodges in the bend; and nine times out of ten, when you take down those pipes, you will find this accumulation of dry rust which cannot be moved by suction. But you can stamp it out by force, and we do it repeatedly in the old services that have been in use for 10 or 15 years. We find no trouble at all, as a general thing; so I say force is by all means preferable to suction.

Mr. Fenner—I was going to say about the same thing, only I want to add that in using both combined, suction and force, you get the best results. I mean to say that if the man who works the pumps gives plenty of suction, he can then use the force more effectively.

The Secretary—In reference to that, I think it might be well to make a suggestion. I suppose everybody else may have thought of it, but I know a great many gas superintendents, in blowing out services where rust has accumulated, blow directly into the main. That was the practice in force in my place a good many years, and finally it gave us bother. We found a 3-inch pipe stopped up with an accumulation of rust, and a complaint from defective services. Now for years past we have adopted the method of cutting off the service at the main and blowing it out in that way. It saves both the service pipe from undue pressure, and the main from being filled up.

The President—All I can do is to give my own experience as testimony. I agree with Mr. Fenner that both suction and force combined are better than force alone. Using force alone has a tendency to compact the thing that obstructs. It seems that the higher the pressure I get the tighter it is, but by using a steam plunger used as a piston, and, if necessary, a little water above it by the edges of the main, it produces pressure on the obstruction, and finally separates it, and the first thing you know you get your pipe free. We have done that with pipes 48 feet long, and have made them as clean as a whistle.

Mr. Hollidge—I believe force is the best.

The President—I simply give you my experience. I have put on pressure and hammered the pipes, and it seemed the more pressure I got on, the tighter the obstacle became, especially where lodged in an elbow.

Mr. Hollidge—We used to have in operation, 20 years ago, a pump that would carry hot water. We put hot water in the pipe, and it was very beneficial. I believe in force in that way.

The President—As far as naphthaline is concerned, I presume that would be all right; but Mr. Eichbaum spoke of accumulations of rust, which often appears in granulated forms, sometimes in scales, sometimes in dust; the scales are like so many little valves, and the dust filling up the interstices makes an almost solid bulb.

The President—

"What is the cause and prevention of granulated rust in house pipes?" Assigned to Mr. Gregory.

Mr. Gregory—That cannot be answered in so few words as some of the others. It is a difficult question. I thought I could not answer it at all. I turned back to my friend, Mr. Britton, and tried to find out if he would not assign it to some one else. He didn't do that, and I thought I would see if he would give me some pointers by which I could get along with it, and he reminded me that the best interests of this institution demanded that each fellow should do his own thinking. So I got to thinking of the matter, and this was about the result: There is nothing to keep black, uncoated iron pipe, such as gasfitters use, from rusting while in place, with the caps off, and temporarily out of use. The cold iron in the walls and ceilings condenses the moisture of the air inside of the pipe, and this moisture adheres in small globules to the iron, making a chemical combination which must form iron oxide. When the pipes are in use, however, they are full of gas, making a very different chemical condition. According to a table of the analysis of 12 English coal gases, found on page 196 of the "American Gas Engineers and Superintendents' Handbook," we find the constituents of coal gas to be:

	Vol.	Vol.	Vol.	Vol.	Vol.	Vol.	Vol.	Vol.	Vol.	Vol.	Vol.	Vol.
Hydrogen	45.58	46.0	27.7	43.77	41.15	51.24	51.80	47.83	50.28	47.60	41.72	25.82
Marsh gas	34.90	29.5	50.0	38.18	40.66	35.28	35.26	36.84	36.95	41.53	41.88	51.20
Olefiant	4.08	3.8	13.0	5.03	3.67	3.56	3.53	7.62	6.34	6.97	19.66	22.98
Quartene	2.38	...	...	...	...	...	...	...	...	...	...	...
Carbonic oxide	6 64	7.5	6.8	5.69	8.02	7.40	8.95	5.27	4.37	7.82	4.98	7.85
Sulphureted hydrogen	0.29	...	...	...	...	...	...	...	...	...	...	...
Carbonic acid	3.67	0.6	0.1	1.81	0.29	0.28	...	...	...	...	...	0.13
Nitrogen	2.46	0.5	0.4	2.31	5.01	1 80	0.38	5.29	...	...	2.71	1.51
Oxygen	...	...	...	0.10	1 20	0.44	0.08	0.06	...	...	...	0.13
Aqueous vapor	...	2.0	2.0	...	...	...	...	...	...	...	...	...

In six out of twelve of these statements there is no oxygen, and in ten out of twelve there is no aqueous vapor. Oxygen and aqueous vapor are almost unnoticeable constituents of purified coal gas. It may, therefore, be said that the compound in the pipe will not rust iron. To look at the matter in another way, it may be said that, there being plenty of iron oxide in all of the purifiers, the rusting power of the gas is completely exhausted before it passes the third one. To practically prove that the gas will not rust the house pipes when they are filled with it continuously, we have but to examine an old wrought iron main, that has been in the ground for years, and we will find that, though the iron may be rusted nearly through from the outside, it is

not pitted at all on the inside; but, on the contrary, it may have a light coating which would have a strong tendency to protect it from rust were the oxygen really in the pipe to rust it. I do not want to put this dirty sample among the nice things on the table, but you will all recognize that the pipe is rusted clear through from the outside, but that on the inside it is not affected at all. The gas was in it all the time. It would not be so with the house pipe when the caps are off. In brief, one cause of rust is improper purification of the gas, and the preventive is by proper purification. Another cause of rust in the house pipes is the air charged with different degrees of moisture while they are open and not in use, and the preventive in this case would be the use of galvanized iron pipe. A prominent gasfitter and plumber in San Jose thinks that carrying a line in stock of plain uncoated black pipe, another of dipped pipe, and still another of galvanized iron pipe, is one of the foolish things that the trade should abandon. The saving, while using galvanized iron pipe, in the repair of leaks that would be found in the black pipe and fittings before the work could be accepted by the inspector, will about pay the difference in price, and you have a better job in the end.

Mr. Eichbaum—I have heard what Mr. Gregory says, and he omits one factor in the rusting of pipes on the inside, even when gas is in them. It is well known to almost everybody that there is a large amount of aqueous vapor carried along with the tar and gas which fills up the drips in the streets, and many times fills up meters, and where service pipes are exposed we frequently have to put drips on the services to catch the water, which goes with the gas as aqueous vapor. That is enough to account for the rusting of gas pipes in the house; although, of course, there is very little oxygen, there is water, which is oxygen and hydrogen combined.

Mr. Hollidge—I would say that I had a little experience only recently on that very identical subject. In reference to our friend Mr. Gregory, he states that he does not think rust will accumulate while the gas is in the pipes. Just lately we had several houses that could not use the gas from the fact that the pipes were in such a bad condition. The consesequence was that I had to send out of town to get a force pump, cut up the floor in many places, and take up the pipes.

Mr. Gregory—If the last speaker doesn't like my idea of the formation of rust, I would like to ask if he likes my idea of galvanized iron as a preventive?

Mr. Hollidge—Yes, I do.

Mr. Kinney—I would like to ask if there is any difference in the quality of ordinary black pipe? Is there such a thing, for instance, as some kinds of black pipe rusting and others not, under the same conditions?

The President—I can simply add my testimony in this matter. It extends over quite a number of years. In New York city, long before they thought anything about oxide, it was part of our work to clear out pipes of buildings, especially churches, theaters and halls, where we often found granulated rust about the size of gunpowder. In many cases it had partially filled the pipes where they were in active service right along, but very seldom where the pipes were out of use. Now, in the matter of difference in pipe, lately a steel pipe has come into the market which has caused every one that has used it to wish that the man who invented it had emigrated or died before he put it in the market. Relative to the galvanized pipe, we had occasion to relay services upon some of our principal streets, and as some of the black iron services were in fairly good condition, we left them in. It happened afterwards that a block burned down, and I thought while it was being rebuilt the services should be renewed. I found that the galvanized services in the ground rusted fully as fast, and sometimes faster than those of black iron. We reasoned, that as galvanized iron pipe is dipped first in a bath of muriatic acid, and then in a bath of zinc, oxidation takes place when in contact with moisture, other conditions being favorable, the zinc going into muriate of zinc, and the iron rusting faster than it did before. This is my experience. I have found many services just in that condition under the gutter, and have attributed it largely to the saturation of the ground with the urine from animals standing along the curb. We always find the top of the pipe eaten away, the bottom of the pipe being in good condition.

Mr. Gregory—The President was talking about galvanized iron pipe rusting as rapidly as any other pipe?

The President—More so.

Mr. Gregory—But I wanted you to notice that I was talking about the inside of the pipe, and he was talking about the outside. I agree with him that alkali in the soil will cut away the iron, and galvanized iron pipe will rust about as rapidly in the street as black pipe. But I firmly believe that galvanized iron, if used on inside work as house pipe, will not rust. They voted me down on this matter, though I had the material here to show practically that the pipe had been in the ground for a great many years, and had neither rusted on the outside nor on the inside. I have that much in practice to show for it, and yet other members have said, "We found plenty of rust in the risers." A good thing to do with your risers when you put them in is to put a tee at the bottom, and then you can get at them very easily and take the rust out. Still, I am very much in favor of seeing galvanized iron come into use, and am like that plumber in San Jose. I believe if we were using galvanized iron entirely, instead of three kinds of pipe, the trade could supply galvanized iron nearly as cheap as it does the other lines.

The President—The matter of oxidation is a problem, or else it would not be asked about here. There are a great many things about it that are very puzzling. As to the introduction of drips: A drip pipe will stand for years and be as good as it was the day it was put in, rusting neither inside nor out. But this question seems to be applied to house pipes, and there is where we meet with trouble. It is very seldom that service pipes are stopped up with this granulated powder, but the house pipes are frequently. Gentlemen, we will have to pass this and come to the next question, No. 10.

Mr. Hollidge—Before you close that little argument: Years ago, in the streets and thoroughfares where the mains could not be torn up very often, a system was in use to utterly avoid all that rusting of services, and I believe to-day, if the larger companies, and even the smaller companies, would take it up along their principal streets, it would prevent a great loss of gas. Where I, for seven years, served my time in this business, we used a V-shaped trough of 3-inch material under the service, so that it did not matter whether it was lifted or not. First we would tar the pipe, and afterwards put this little piece of 1 inch by 3 inch under the pipe in a V-shape, and block it up with bricks or anything we could get. That I have seen last 20 years, and when taken up it was just as good as it was when it was put down. For the great thoroughfares of our cities to-day it is one of the finest things known. The service will never rust, and, moreover, if you dip that service in oil tar, not coal tar, but oil tar, and let it get a coating of the oil tar inside and outside, you will find it will preserve the pipe still better. You will never have any trouble from your services leaking if you do that.

The Secretary—That brings to mind a suggestion I would like to make that we have found to be very useful in caring for our service pipes. We tar our service pipes with a brush. We attach every length of pipe to the exhaust of one of our pumps, which heats it up to the necessary temperature, and then with the brush we put on this oil tar which dries off just as glossy and hard as if painted with black varnish and it is hard to knock off. Some which has been in the ground a long time shows no signs of wear. I think it is far preferable to the ordinary system of dipping pipes, and is very inexpensive. A man with a brush and a pot of oil tar can go over a great many thousands of feet of service pipes in a day and change the sockets at each end as we dry it.

Mr. Gregory—We do the same as Mr. Britton; then in regard to this trough that our friend spoke of, we have a habit of making a little trough of dirt close in around the pipe, leaving room for the oil tar, which we pour over the service, forming a plaster that kills the alkali in the ground, and I think makes a very good thing.

The President—The tenth question is:

"Is there any better solvent than gasoline for naphthaline stoppages?"

Mr. D. J. Collins, of Philadelphia, answers that question as follows:

"Gasoline, chemically considered, is composed almost entirely of the lighter members of the paraffine series of hydrocarbons ($C_n H_{2n+2}$). Naphthaline is only slightly soluble in these hydrocarbons, and therefore gasoline must be a poor material to use for this purpose.

"Probably the best solvent for naphthaline is coal tar naphtha, which is composed of members of the aromatic series of hydrocarbons ($C_n H_{2n-6}$). These hydrocarbons are all good solvents for naphthaline, and especially toluene (C_7H_8), which constitutes a large part of coal tar naphtha. One hundred parts of toluene will dissolve 31.94 parts of naphthaline at 61.7° F.

"Absolute alcohol is a fairly good solvent for naphthaline, 100 parts at 59° F. dissolving 5.29 parts of naphthaline.

"Wood alcohol will also answer fairly well as a solvent.

"Ordinary naphtha if not used in too large quantities is a cheap and easy solvent, and one readily obtainable. In using naphtha it is necessary that as soon as it has performed its object that it shall be promptly pumped out of the main or drip. Otherwise the naphthaline which has only been dissolved will be redeposited at another point.

Where large deposits of naphthaline are to be removed, as around the works, a good plan to be followed is to spray in naphtha by means of a steam jet."

Mr. Eichbaum—The only answer that can be given, is, that naphtha and gasoline being so much cheaper than wood alcohol, alcohol or benzol, practically there is nothing else to use but naphtha, even though it might not be quite as efficient as the other solvents mentioned. So theoretically he is right, but practically he is wrong.

The President—

"In furnace lining, which is preferable, brick or blocks?"

Mr. Eichbaum—Now you come to a subject that strikes me as something I like to speak about. Of course, when we speak of furnaces, it does not make any difference whether the furnace be a generator, or whether it be a bench. Years ago when we first started, we had nothing to use but bricks, which were about 2½-inches at one end, 1½-inches at the other and 9 inches long, with the small end next the fire. That is all we could get, but they lasted very well indeed. Afterwards I sent East and had some blocks made which were 6 inches high and 10 inches deep, made exactly to the curvature of the furnace. I put those in, they laid up beautifully, and I thought, "There, I have got a lining that will last three years." Instead of that they did not last six weeks before they began to give out, and, of course, I set myself to find out what was the reason they lasted so short a time. I found the mortar joint corroded a little, and when we first got up a heat the joints commenced to get red hot here and there, while the center of the block was comparatively cold, and the consequence was they crumbled off and crumbled off, until the first thing we knew the block in place of being straight was very irregular. They kept on wearing away until some of them actually fell out, and, of course, having a stock of blocks of that kind on hand, we used them all up eventually, but they did us no service whatever. With a brick which is only about 1½-inches or 1¾ inches thick, and 4 inches deep, one has a multiplicity of mortar joints, which everybody knows is bad. The plan that has been adopted now by the U. G. I. Company, and which shows the truth of the aphorism that, "The truth lies in the medium," is as follows: A brick is used which is 4 inches wide only, and which does not present a large surface. It comes nearer getting hot all over, and these blocks I have found to wear remarkably well, so much so that we have used one set of blocks ever since last November, and they are still in pretty good shape, whereas, if they had been brick, they would have to have been removed, and, if they had been our former blocks they would have to have been renewed six or seven times. So that is my answer to this question. There is a proper, just proportion which is the right thing for furnace linings. Now a firebrick which shows 2½-inches thick is a very good proportion indeed. The firebrick lasts remarkably well, but large blocks, as a general thing, do not last at all.

The President—Mr. Converse, will you add your testimony?

Mr. Converse—I think if properly made, there is nothing better for furnace lining than common firebrick.

Mr. Russell—We have found in the manufacture of blocks for furnaces—speaking more of that than of the cost of the apparatus—that a block 6 inches wide, about 3⅜ inches high, and 13½-inches long, which could be power pressed the same as a brick, was much superior to the large block. The large blocks, being made in a wooden mould, do not get sufficient pressure, nor are they thoroughly burned through. When the outer shel', which has been next to the fire and fully burned, wears away, the slag gets on to the interior, which is softer, and then the breaking off with your bars ruins the block in a very short time. Another block that is used a great deal is 3⅜-inches high, 6 inches wide, and only 9 inches long. Back of that block the lining of brick is laid, so that the former can be taken out, and this 4½-inches of brickwork is retained in position. Thus you can patch them conveniently in a very short time. I think the main reason why those blocks last better is that they are power-pressed, as the brick are.

Mr. Eichbaum—Much depends upon the material which you put in the brick or blocks. Some years ago when I was superintendent of a rolling mill in Jersey City, N. J., we often melted down the arches of our heating furnaces. They did not last very long, but they gradually melted. Mr. Brown was furnishing our bricks, and I spoke to him about it. He said it was better to have a brick which melted easily than it was to have brick of hard material which would not last so long. But he added: "I will make you some bricks that I will guarantee that you can't melt, and you can try a lining of them." So he sent them over, and we made the arch over the heating furnace out of these very hard bricks. While the others would last three or four months, these did not last three or four weeks, for they were so hard and so brittle when they were hot that they simply dropped out in place of melting. I have no doubt Mr. Russell has had experience of the same kind and would testify to the same thing. A great deal depends, in answering this question, upon who makes the blocks and who makes the bricks.

The President—And, possibly, upon the one who builds the furnace.

Mr. Eichbaum—I don't think that makes much difference.

The President—The reason I make that remark is because of that "experience" you heard read this morning. You recollect the back bench brick worked out; it was composed of brick well laid, but it was the fault of the construction of the furnace. I am in favor of building up furnaces with brick, or as Mr. Russell suggests.

Mr. Eichbaum—To sum up the whole matter, large blocks are objectionable.

Mr. Russell—Mr. Eichbaum's remarks are entirely correct. The manufacturer must make goods suitable for the purpose intended. Now, for what we call high, dry heat, you want a very porous brick; that is, the burnt brick put in the mix should be large, and a great deal of it at the point where no slag reaches it. Where brick is made of large material it does not shrink as much as one made of small material; but in a furnace where slag or iron rubs against the lining, or where clinker rests, a brick made with quite fine material is preferable, because it does not wear away so quick as with the larger stuff.

The President—The next question is:

"What experience has been had with steel pipe for services?"

Has anybody got a good word to say about steel pipe?

Mr. Eichbaum—I have answered a great many questions and I would like to hear somebody else speak on this query. For my part, I condemn steel pipe entirely. I have discovered more holes in steel pipe (it was comparatively knew) within the last four or five years than ever I had before in cast iron or wrought pipe. Steel pipe in my judgment is defective and I shall go back to iron pipe.

The President—My experience with steel pipe was confined to one car-load, and I will never have any more. It is simply impossible to use it where much cutting or fitting is being done, especially in putting up gas stoves. It will cut out and ruin, in half-an-hour, all your dies. Besides, steel pipe will rust more quickly than iron pipe. My experience in general is that, if you get good wrought iron pipe, with a glossy surface free from blisters or lumps, you will get pipe that will last longer than any other. Mr. Lally, who represents the Crane Company on the Coast, and imports a great deal of that pipe, in replying to a letter in which I asked him the question before you, said: "Relative to the use of steel pipe for gas service, I have only to state that nine-tenths of all the pipe now used on this Coast, and in fact in the country, is steel, and the satisfaction it gives is best determined from the complaints received from the different users. There have been practically none, at least such is my observation, from gas companies, probably for the reason that, as a rule, there is not so much cutting, bending and fitting done for service as in some other branches of pipe work, say the running of gas on buildings. Now, on this class of work steel has not averaged as well as iron, the smaller sizes of the former being very uneven. Although some of it may be mild, properly welded and satisfactory in every way, the next lot is so hard as to spoil the dies in cutting threads, and will break off short or open in the weld in bending. There has been so much complaint from the plumber and gasfitter that we have considered it expedient to carry nothing but wrought iron pipe in sizes below 1½-inch, but in the absence of complaint from the gas companies it is fair to presume that steel pipe for service work is proving satisfactory."

Mr. Gregory—I find that the pipes split very much. I am willing to have my statement written down that I am opposed to steel pipe, because we have tried it long enough. When I changed, I changed to galvanized iron pipe; perhaps I am getting to be a crank on galvanized iron pipe.

Mr. Eichbaum—We used large quantities of steel pipe. One thing that struck me as being singular was, no later than last week I asked my foreman how the steel pipe worked about the dies. He said the change from iron to steel had not affected the dies at all, that our dies lasted as long as they ever did, whereas I see it occasionally stated in the papers that it is too hard and does not cut well. We have had nothing of that kind. The trouble with us is finding unexpected holes in the pipe itself. As to what has been said about rusting, I consider it a chemical fact that steel pipe will not stand corrosion from the elements as well as iron. Steel pipe is homogeneous, the same thing all the way through, whereas iron pipe is a layer of iron and a layer of slag, and a layer of iron and a layer of slag. In each pipe there are three or four

layers, each one of which layers has slag, which is practically outside of iron, and resists the action of rust and the elements, whereas the steel pipe, being homogeneous, will eat right through. Moreover, I am satisfied that steel pipe put under the same conditions as iron pipe will be useless, while the iron pipe will be found all right. I have seen the most astonishing effects of rust in steel pipes exposed to the action of the air, effects that I did not think could possibly happen. Pipes have not lasted months where they should have lasted years.

The President—I think the proper question should have been :

"Has anyone got a good word to speak for steel pipes?"

Question No. 14 is :

"What is the best method of treating crude oils from 14° to 24° B, and what have been results in use of same on mains and meters?"

The Secretary—Mr. Cline has requested me in a letter to answer that for him. As a great many companies have been using oils of heavy gravity, even as low as 12° B., I thought it might interest the members who were contemplating the use of these heavy oils to know of the experience of a man who had been all through it. Mr. Cline, of Los Angeles, has tried it. He has written to me that crude oil from 23° to 26° gravity needs no treatment at all, when used in the generators, but below that, if it is used without mixing at all with any lighter oils so as to increase the gravity, it should be superheated very strongly with steam, and that, so far as its effects on mains and meters are concerned, he found no difficulties at all in the use of oils.

Mr. Eichbaum—I have used 3,000 or 4,000 barrels of oil not over 17° gravity without any difficulty at all, or any treatment, but it requires extreme care in the management of the works, because the resultant tar is so heavy, that unless you keep the tar well mixed up so as to have it all uniform, you will have a stoppage somewhere in the works. So far as the effect on the mains and meters is concerned, the ultimate result of the gas formed by the use of any oil, no matter how heavy, would be the same in all cases. Nothing should go into the mains or meters but gas, and the gas will be the same, whether it is made from oil of 40° gravity or 12°. We have had no trouble of any kind in the use of heavy oils, beyond requiring excessive care in the works itself, to keep the heavy tar from lodging in some particular place.

The President—The next question is :

"What has been the experience with gas engines during the year for power or lighting purposes?"

Mr. Adams (Stockton)—We purchased an Otto gas engine and it is very satisfactory. We had a man in the East for the last two months looking at all gas engine plants. He returned last Saturday, and I have not yet seen his report.

The President—This experience of yours is cited from natural gas, is it not?

Mr. Adams—Yes, sir ; we run entirely on natural gas.

The President—About what power do you get per cubic foot per hour from natural gas?

Mr. Adams—I cannot tell you.

The President—Who else present has had experience with gas engines?

Mr. Jones—I would like to hear from Mr. Guldlin.

Mr. Guldlin—I have had some experience in the building of large engines, very little in small ones. The question has come up about using large engines for driving generators and dynamos, especially so in natural gas districts. We have built engines for this purpose, one of 75 horse power, which generates electric current for the running of four cars. That has been in operation for about one year, and has maintained a very satisfactory regulation ; in fact, the manager of the road claims that the regulation has been fully equal to that of any steam engine. The consumption of gas at that station I cannot very well state, for the reason that they are buying their gas by contract. In an Iowa city they are driving an alternating machine with an engine of 100-horse power. The size of the latter I do not exactly remember. Although the current fluctuates from 100 to 120 amperes on the street railroad, the engines maintain a perfect regulation of the lighting circuit or lighting supply, so much so that variation will not exceed over 2 volts, and fluctuation will be within 1 volt, minute after minute. The consumption of gas at that station we have been able to get, having two meters, one just installed, and the consumption is about 12½ cubic feet per indicated horse power, and 15 and a fraction per brake horse power. Now this of course is natural gas, and in making a comparison with coal, water, or any other gas, it will be a question of heat units largely. In England, or in Europe, I believe some of the large plants are also using producer gas. Now, throughout the East, smaller plants are being put in. What they call isolated plants, with block system, driving dynamos for lighting large buildings, have proved very successful and economical, especially so in the natural gas section. Engines are also being installed in towns using artificial gas, and I think that in that direction the gas companies have awakened to the fact that they can get consumers which they otherwise would not reach, and are pushing the gas engine business quite vigorously. One advantage which we have found in the construction of a gas engine is not to follow steam engine plans for weights or strains. A gas engine should be built more on the principle of a steam hammer. You should have it not only sufficient to do the work, but also sufficient to absorb the shocks. When you think for a moment of the series of explosions by a gas engine which has a pressure of 225 to 300 pounds per square inch, you can readily see where that comes in, and I think a good many failures in gas engines can be traced to this cause. Another thing is, that it has generally been believed, and so stated by builders themselves, that any kind of an engineer, or any kind of an attendant, is good enough for a gas engine. It is entirely wrong. A gas engine to be operated properly should have the same care and skill as that given to any first class steam engine, and without such it will not work. We have had some very interesting experiences ourselves in this respect. In putting in a gas engine be sure that the gas connections are large enough to supply more than the number of feet of gas which a gas engine will consume per hour. You must remember that you have four strokes and only one gas admission, consequently, when you take in your gas you take it in very rapidly, and at the rate of four times the actual consumption per hour. This point has very frequently been overlooked, resulting in failure. We have had experience also in that line. Another thing is to have an ample water supply. The water supply should be sufficient to maintain a uniform temperature in the cylinder. If not, especially when you come to the larger engines, the unequal expansion which would result might cause a shut-down of your engine, by pounding between the piston and the cylinder. We did not formerly realize it as forcibly as we do now. Within three days interval we discovered where the fault lay : In the insufficient water supply. At the same time, the engine was built strong enough so that there was no other damage except to drag the piston. Another thing which should be carefully looked after in a gas engine is the oiling of the cylinder. We maintain a very high temperature, and nothing but the very best oil is used. There are several oils on the market, and as they cost only from 16 to 18 cents per gallon, there is no necessity for trying to economize in this respect. When increasing the lubrication, one is less likely to have pounding between the piston and the cylinder. I now want to call attention to another thing—I mention these things because I know engine plants, which really were not to blame, have been thrown out for causes of these kinds, and, as you may have experience in engines of larger size it may be quite opportune at this moment. Never connect the exhaust of two engines, but always keep them separate. If you do not, in lifting your exhaust valves the exhaust from one engine will be forced into the clearance, or what we call the compression space of the other, and will give you variable pressures and mixture. We built one of our plants by special request, making quite extensive arrangements for the deadening of absorption, and we did this by running the exhaust into two large cylinders. It was in the heart of the city, and there was a dancing hall above, and other buildings close by. We did not discover the defects in this plant until we began to investigate to ascertain why it did not develop the same amount of power on its foundation that it did on the shaft, and then we found it very quickly ; but, if these conditions are carefully considered and carefully provided for, there is no reason whatever why gas engines should not be introduced quite generally. As for their economy, any builder will guarantee you an economy which will equal that of any steam engine, whether it is by producer gas, natural gas or artificial gas ; that is, conditions permitting it. We are looking forward to quite an increase also in the size of engines. We are somewhat hampered in this country yet. The largest engines which have been used in practical operations are the ones I have referred to. There are others now being built of larger sizes, but not yet out ; and there are builders now who are prepared to furnish any size of engines in single cylinders, up to 500-horse power, and tandem up to 600 horse power. As to the regulation, that has also been done by governing the lights, and we can produce uniformity of running equal to that of any steam engine. I have seen more variation in the working of a Corliss engine under these conditions than we had in the plant I referred to.

The President—The next question is :

"What percentage in cost of gas does manufacture and distribution bear to the total?"

This question was assigned to Mr. C. O. G. Miller, and the answer made to the Secretary is as follows :

"To me has been assigned the answering of the question, 'What percentage in cost of gas does manufacture and distribution bear to the total?' I think that question is as difficult to answer as, 'How big is a piece of cheese?' And instead of trying to answer it shall try to show why it cannot be answered in figures. The manufacturing cost is governed almost entirely by the price of oil and coal, and price received for coke, all of which vary from 10 per cent. to 50 per cent. in a year; and unless one is familiar with these prices the knowledge of the cost of gas per thousand in the holders can convey little idea as to the economy and efficiency practiced by the engineer of the works. On the other hand, the cost of distribution varies very much with the amount of gas sold, and the average yearly consumption of gas per meter. The cost of taking statements, setting and removing meters, and attending to complaints, not including foreman's pay, is about $1.65 per year per meter in large cities. One company I know of sold 42,780 cubic feet of gas per meter set. Not having a corresponding increase in sales, the several thousand additional meters in use in 1896, added to the cost of distribution in cents per thousand over that of 1891. It would obviously have been unreasonable to expect the per thousand cost not to increase. The price of manufacturing supplies decreased between 1891 and 1896, reducing the manufacturing cost, so that while the company I have reference to may have been as well managed in 1896 as in 1891, the proportion of manufacture and distribution to the total cost varied very much in those years. The larger gas companies notice an increase in taxes every odd year of about 1 per cent. per thousand, caused by the larger tax levy that always immediately follows a session of the legislature. The above are some of the reasons why I think it impossible to state the percentage that manufacture and distribution should bear to the total cost of gas."

Editors Named.

The President—Gentlemen, I believe this concludes the executive session of 1897, and I want to thank you all for your support to my administration, I bespeak for my successor an equally successful support. I will appoint as Editor of the "Wrinkle Department," Mr. George H. Hollidge, of Merced, and will put the "Experience Department" in charge of Mr. Clements, of Red Bluff.

Belated Questions.

Mr. Gregory—I want to ask a question that it may go on record as having been considered by the members of the Association. Have the members of the Association had any demand for tar for the purpose of killing squirrels. Some demand on that account exists in our locality and we are going to encourage the introduction of tar for this purpose as much as possible. If it is continued all over the Coast, and farmers buy a great deal of tar, it will make a difference in our sales of tar. We won't have so much trouble in getting rid of tar.

Mr. Keaton (of Gilroy)—I have sold all the tar I have made in the last six months to farmers, who used it in killing squirrels. They take a strip of rag 2 or 3 inches wide, and 3 feet long, saturate it with coal tar and push it into the squirrels hiding place.

Mr. McNeill—I have been working on gophers in a similar way. It cleans them out every time.

Mr. Thompson—I would like to ask what is the best way to treat a generator stack to prevent it rusting on the inside from the exhaust steam?

The Secretary—Paint it with oil tar.

Mr. Eichbaum—There is nothing to equal oil tar. I am talking about the outside. On the inside nothing will stay, for it will burn off. I have found out by considerable experience that there is no paint of any kind that will stay on iron equal to oil tar, and our holders at the present time are in as fine condition as they can possibly be, and they have not had anything on them but oil tar for a good many years. Before that time we used to paint them laboriously with iron oxide or red lead every year. Now, with the exception of dust blowing on them, they are in just as good shape after three years as they were after two or three months, and all the expense we have is just the labor. It seems to me if everybody interested in the oil tar business (and so many are at the present time) would interest themselves in giving away occasionally to somebody who can use it some of this tar, you would find you would soon work up a demand for it. We sell thousands of barrels where at first we could not sell one, and the use of it is growing every year. In fact I am perfectly safe in saying that for any purpose whatever, one barrel of oil tar is worth two or three barrels of coal tar, because coal tar dries up and gets away, while oil tar stays for years and years. On the roof of a holder it will stay forever. Another thing: You paint the roof of a holder with red lead, or paint of any kind, the gas will leak infinitesimally, not enough to burn, but will get under the paint and make a blister and then corrosion will come in. Strange to say, that does not happen at all when you paint with oil tar. It gets so hard the gas cannot get under it at all, and it will stop these infinitesimally small leaks that used to be the curse of our lives in the roofs of holders.

On motion the meeting was declared adjourned.

[Prepared for the Journal.]

Some Abstracts from a Review of Some Articles Printed in the "Journal fuer Gasbeleuchtung."

By Mr. Frederick Egner, Norfolk, Va.

A most carefully prepared and exhaustive paper, by Mr. Emil Merz, Manager of the Municipal Gas Works at Cassel, appeared in the *Journal fuer Gasbeleuchtung*, of July 17th, the subject being: "What is the measure of gas consumption which should be taken as a base for calculations in the erection of new, or the extension of old, gas works?" The title of the article is in itself quite comprehensive; and as the conditions under which gas is used in Europe do not differ greatly from our own, the conclusions reached by Mr. Merz are worth remembering or placing them for handy reference. In the course of his paper Mr. Merz remarks that had the proprietors of gas works, at their beginnings, treated these works with the same lavish liberality, now so frequently seen in the installation of electric lighting plants, the gas industry would without doubt be in a more prosperous condition to date than it is found to be.

The paper under consideration contains two tables of statistics, showing the consumption of gas under the following headings: Cooking and heating; power purposes; public lighting; used by gas plant; unaccounted for; and totals. The figures given are taken from the reports of 78 cities.

There are other tables showing the amount of gas manufactured per annum and head of population in 38 cities, also several shorter tables, all of which are then combined and condensed in the following neat and useful form:

Gas used per capita of population per annum.

	Least. Cubic Feet.	Medium. Cubic Feet.	Greatest. Cubic Feet.
Private illumination	1,235	1,765	2,295
Cooking and heating	706	1,235	1,765
Power and industrial purposes	176	549	882
Public lighting	211	317	549
Used by gas manufacturer	52	52	52
Leakage and condensation	105	176	247
Totals	2,485	4,094	5,790

These figures show only the finals in each case, and in using it should be considered that possibly, owing to location, no gas (for example) will be used for power at all; or, that because there may be many places of amusement, the sum for private illumination "for the highest," should be taken, while at the same time very little for cooking or heating may be expected; and hence that "for least" would be used, etc., etc, An example is given: Suppose that, by considering all the local conditions, a consumption of 3,513.4 cubic feet is found per capita; then, for a city with 70,000 inhabitants, a works with a maximum daily capacity of 1,235,990 cubic feet is to be provided, which corresponds to an annual sendout of 247,198,000 cubic feet. But if the projectors are wise enough to take a long look ahead, they will in such a case provide for a doubling of the demand for gas in the purchase of land and buildings at least. On the whole, Mr. Merz's paper is a very interesting and instructive one.

Mr. H. Gerdes, Chief Engineer of the firm of Julius Pintsch, at Berlin, Germany, gives us some valuable information in relation to the lighting of railway carriages, with special reference to the use of acetylene gas in connection therewith. Incidentally, he makes also a comparison of cost of gas with electric lighting for the same purpose, bringing out some very interesting facts. That we may say "facts" in connection with Mr. Gerdes statements, would be self-evident to the careful reader and student of Mr. Gerdes scholarly and thoroughly able paper, which runs through several numbers of the *Journal*, from which these extracts were taken.

He shows that the ordinary gas lamp delivers light at 0.306 pfennigs per candle, the regenerative gas lamp at 0.19 pfennigs, and the electric glow lamp, at the most favorable figures, all the way from 0.41 to 0.85

pfennigs. (The writer omits translating the coin value of above as unnecessary, since the relative value is plain enough from the figures as given.)

In giving the cost of the electric light, Mr. Gerdes does not charge the deterioration of the latter against it; but, while calling attention to it, permits the electric glow lamp to be credited with its full starting illuminating power, although he shows in an annexed table that the lamps were reduced nearly 70 per cent. in illuminating power within 158 hours burning.

The firm named made some costly experiments with acetylene gas, and the final results seemed to prove that there is a decided danger in using it for the purpose of railway illumination; and, for the matter of that, for any illumination where large bodies of the gas may be exposed to an increase of temperature, by which even a very small portion of the bulk may reach the splitting point. Herr Gerdes' paper is certainly a most timely and instructive one.

At the thirty-seventh annual meeting of the German Association of Gas and Water Engineers, held at Leipzig, Germany, during the past month of June, the matter of inclined retorts received considerable attention. The Commission appointed two years before, to gather and report upon experiences with that method of setting retorts, made its report. The Commission was continued for another year, with an allowance of money, to enable it to continue its labor of collating statistics to be used in future constructions by the members. The report was favorable to the system. A paper "On Experience with Inclined Retorts and Charging and Drawing Machines," was also read by Mr. E. Körting, Assistant to the Chief Engineer at the Vienna works of the Imperial Continental Gas Association. Mr. Körting's paper was accompanied by a nicely arranged table, illustrative of his subject; but as a similar one, (and more elaborate), originating from the same place, and by the former Chief Engineer there, Mr. Edward Drory (now Chief Manager at Berlin), was exhibited at the St. Louis meeting of the American Gas Light Association, and translated and published in The American Gas Light Journal, November 23, 1896, it is not necessary, or perhaps even desirable, to reproduce it now. The paper of Mr. Körting was well constructed. The writer of it evidently did his level best to show the charging machines in their best light, but could not help, and honestly did avow, the superiority of the inclined retort system over the preceding ones, however good they were shown to be. But nothing new in connection with the inclined retort system, which has not already been published in the Journal was brought out in the paper; which was a creditable one to its author just the same.

One of the papers read at the meeting of the German Gas and Water Engineers, was that by Chief Engineer Kemper, of Dessau. His subject was "Concerning the Development of the Incandescent Gas Burner for Street Lighting." After treating the matter with the usual elaborate detail, he concluded with the following significant statement: "Incandescent gas light for street illumination is greatly increasing; and it is evident that within a few years every city in Germany will be lighted in that way, excepting perhaps only in a few instances, where for certain squares the *much more expensive electric* arc light may be permitted to remain, instead of this steady, four times as bright as ordinary gas burner light system, of incandescent gas lighting," etc., etc.

There were Commissions on "Photometry," "Gas Meters," "Gas Heating," "Water Statistics," and "Instruction," none of which contained anything of special interest to us over here.

The Extending Use of Gas in Industrial Operations.

[By Mr. Frederick H. Shelton, in *Engineering Magazine*.]

There are about 1,000 towns and cities in the United States wherein a total of approximately 60,000,000,000 cubic feet of illuminating gas is annually manufactured. This gas is used chiefly for lighting, largely for domestic cooking and heating, and to a moderate extent for power purposes. A very considerable proportion of it, however, is used—and to the very highest advantage—in place of coal, as fuel for purely mechanical and industrial purposes. That probably a similar volume of various kinds of gases other than illuminating gas is also made and used, wholly for industrial purposes, is not generally known, except ing to those whose business it is to be informed upon such matters.

It is my purpose to point out the great number and variety of uses to which gas is now applied in the arts and manufactures. Within the limits of a magazine article it is impossible to go into the details of the relative operating cost of gas as compared with other fuels, or of the exact nature of all these increasing applications. A bare enumeration of the principal uses may, however, attract the attention of consumers of hard fuel and lead them to appreciate more fully the advantages of gas fuel.

In the main, heat has hitherto been secured from coal, which, while effective, is relatively cumbrous and inconvenient to handle. If coal could be conveyed as a fluid, from a central point, through suitable distributing pipes, to the various points of use, precisely as is water, steam, compressed air, oil, brine, or other fluids, the advantage, convenience and desirability—disregarding cost for the present—would be obvious to every user. Assume this possibility, and that in many instances "fluid coal," so to speak, is cheaper than ordinary solid coal. From the industrial standpoint gas is simply fluid coal, or fluid fuel. Its use saves time, increases output, betters the quality of goods, eliminates ashes and heavy stoking labor, enhances convenience and decreases expense. Small wonder, then, that it is extensively used and that such use is constantly increasing.

As popularly understood, "gas" is an invisible fluid served from pipes, which in burning gives off both light and heat. There are, however, several well-defined kinds of commercial gas, differing widely in their characteristics and heating power. The principal ones are natural gas, illuminating or city gas, blue or fuel water gas, oil vapor in various forms, and producer gas. These five comprise all the gases used by manufacturers at large to any considerable extent for fuel. Typical analyses of these, exclusive of oil vapors, are as follows:

	Natural Gas from Findlay, O.	Illuminating Gas. Samples Exhibited at Gas Exposition, N. Y., Feb., 1897.		Blue or Fuel Water Gas.	Soft Coal (Taylor) Producer Gas.
		Water Gas.	Coal Gas.		
Hydrogen.....	2.18	32.7	48.1	50.9	12.00
Carbonic oxide.	.50	30.2	7.6	44.5	27.00
Carbonic acid..	.26	2.4	0.3	2.45	2.00
Marsh gas.....	92.60	16.8	36.5	....	2.50
Illuminants ...	.31	14.4	4.3	....	....
Oxygen	.34	0.04	0.4	0.07	....
Nitrogen	3.61	3.1	2.8	2.08	56.50

Commonly spoken of as gases, these are really only combinations—practically definite and constant—of certain other gases, such as hydrogen, carbonic oxide, marsh gas, etc., as may be noted. As these component gases have each a well-defined heating value, the calorific power of any mixture of them (such as one of the above tabulated commercial gases) is readily determined by finding the nature and proportions of the component gases, and then aggregating their heating values. For instance, marsh gas is theoretically one of the greatest heat producing gases, and natural gas, being principally composed of marsh gas, proves in practice to have the highest heating value of all commercial gases. It is obvious that the gas having the greatest heating value is, other things being equal, the most useful as fuel in mechanical operations. For comparisons of heating values the British thermal or "heat unit"—"that quantity of heat that will raise the temperature of a pound of water 1° F."—is used. Natural gas has a value of about 1,100 heat units to the cubic foot.

Natural gas is thus mentioned in order that its great heating power may be noted in figures, in comparison with the artificial gases, of which more extended mention will be made, rather than merely to specify the uses to which it is applied. These uses of natural gas, while many industrially, are only those to which other gases can be applied. To the mind of the writer, the substitution for hard fuel of natural gas, intensely rich, costing but little, and conveniently supplied under pressure, is not a measure so progressive as to call for special commendation. It is certainly nothing in comparison with the skill and invention necessary to successfully and economically make and supply an artificial gas that advantageously displaces solid fuels previously used. To note the success that has been achieved in the use of artificial gas fuel is the especial object of this paper.

Illuminating or "city" gas, as made by the water gas process, is the nearest approach to natural gas, in calorific intensity, of any of the manufactured gases. Made by the decomposition of water, it is chiefly composed of hydrogen and carbonic oxide, both of which gases have a high heat unit value. When these are enriched by petroleum vapors to form an illuminating gas of 25 to 30-candle power, the resulting compound has an aggregate heat unit value of about 725 to 760 per cubic foot. This, the best commercial gas that man can make, is yet, it will be noted, but two-thirds as rich in heating power as natural gas, which so far man has been unable to reproduce on any commercial lines. Illuminating gas, as made by the coal gas process, is gas distilled from rich bituminous coals in retorts, and is composed principally of hydrogen and marsh gas. As served to the public, its heat value is about 630. This carbureted hydrogen, however, whether made by the coal

gas or the water gas process, is primarily made to give light. Richly laden with hydrocarbons and illuminants, its manufacture, purification and distribution are expensive, and it cannot be sold by gas companies at a figure low enough to warrant its general use for heating in mechanical or industrial operations, except where the cost of the heat involved in an operation is but a small proportion of the total cost. Its use is practically limited to light operations, where quality and convenience rather than volume of heat are essential. As the variety and number of such operations are very great, an enormous actual amount of city gas is, after all, used in commercial pursuits. One of the simplest of these applications is heating air. In ventilation a current of air may be conveniently induced by burning city gas in a flue. In dyers' and cleaners' drying rooms, in tobacco seasoning rooms, in drying druggists' preparations, in the warming of lithographers' stones, etc., where a gentle heat is required, city gas is often the agent employed. The ripening of bananas by heat from city gas is common in the fruit trade. Equally common uses are the warming of liquids and melting of metals. In drug and grocery houses gas is used for the heating of vats, kettles, etc. Plumbers so use it in the shop for melting lead and solder. In large printing houses it is used for keeping type metal liquid in linotype machines, and for melting gelatin for ink rollers, etc. In bottling works cau tic solutions for cleaning bottles are kept hot by gas. The heating of irons is a common use. Both hand irons and the rolls of power irons are warmed by gas in laundries. Branding plates, irons for marking boxes or for stamping corks, and polishing irons in various trades, are conveniently heated by gas. In the more strictly mechanical operations, hard soldering or brazing with the blowpipe is very extensively done with gas. In the jewelry and silverware working cities, of which Providence is typical, no mean proportion of the gas company's output is used in the shops for the soldering, tempering, case hardening and annealing small tools, dies, cutters, etc., and in the hundred and one small operations requiring heat. In other directions the uses of city gas seem endless. Dentists use gas in Bunsen burners for warming and for softening cavity fillings. Express companies use it for melting sealing wax—an apparently trivial, yet strictly typical, instance of its convenience. Gas fired ovens for firing decorated china are common. The metallurgist uses gas in assaying. Small tools, springs, and scores of other metal objects are made by gas heat. Hat factories use it in working felt, and shoe factories are large consumers. The filaments of incandescent electric lamps are baked by city gas in some instances. Bakers, confectioners, and restaurant keepers constantly use it in their industries. Bicycle makers use it for liquefying japans and enamels, and for brazing, annealing, hardening, etc. And so the list might be extended *ad infinitum*.

One important use is in water distilling equipments for private houses. The increasing demand for pure drinking water has brought into the market gas heated stills for this purpose.

"Blue" or "fuel water gas," or uncarbureted hydrogen, is the gas made in the first step of the manufacture of illuminating water gas. Composed almost entirely of hydrogen and carbonic oxide, it burns with a clear, blue, smokeless flame, and has a heating value of about 300 to the cubic foot. For mechanical purposes the gas is excellent, and it is simply and cheaply made. Commercially, however, the efforts to make and distribute it to the public at large for heating and industrial purposes have been unsuccessful. The reason is that, while "blue gas" is cheaper to make, its distribution costs as much as that of city gas, and, with its heating value but half or less (owing to the omission of the rich hydrocarbons or oil vapors), it has had to be sold at prices that have not repaid the makers. Even when sold at but half the price of city gas, it proves, on the whole, to be still as costly *per heat unit*, and is, therefore, limited, like illuminating gas, to small operations. The plant for making it, however, is comparatively simple, and in numerous cases manufacturers who could not afford to buy either city or blue gas of another have yet found it practicable and economical to put in individual plants to make their own supply, thus saving the cost of distribution and management, and the profit. They thus obtain a gas of good heating value, clean and complete in combustion, easily piped and applied and low in cost. For practically all the industrial purposes for which city gas is used, and kindred ones where small or moderate volumes of heat are required, it gives satisfaction mechanically, and often secures a marked economy over hard fuels. Many private plants are using this gas. Probably its most typical use is in factories where metal working in many small forges is conducted upon a large scale, as in cutlery works, for which purpose it is an ideal fuel, vastly superior to coal. With coal there is the liability of unevenness of fire—causing irregularity of goods and loss of time; with gas, there are no ashes to handle, and if the forges or furnaces are lighted half an hour before starting up, all will be at proper heat and continue so throughout the day. The work per forge or man is increased; time is economized, and "seconds" are decreased; cost is lessened, and the quality of the product usually bettered. In such work the gas is principally used in ovens or furnaces, which are simply firebrick lined iron boxes, mounted on stands of convenient height, for drop forging, annealing, tempering and hardening, case-hardening, die making, etc. Blue water gas has also been used for years in the largest saw and file works in the country, and particularly in watch works. In the latter it has proven peculiarly suitable for delicate work, such as the annealing and tempering of fine springs, the enameling of dials, the melting of gold, silver and platinum, fine blowpipe work, etc. An interesting instance of the perfect suitability of gas fuel for many specific and unusual purposes in industrial operations is the use of blue water gas in one of the large New England bleacheries for singeing the nap from cotton cloth. The old way involved the use of a heavy copper cylinder, revolving over a bed of coals that kept it hot. The web of cloth was rapidly moved over it, from one roller to another, in such a way as to graze the hot copper roll, tangentially. The momentary contact burned off the nap, but was also liable to burn holes in the cloth by fuel specks carried up, etc. The copper rolls were expensive, and warped and cracked in use, involving frequent re-surfacing. The substitution of gas has made a perfect arrangement. In place of the copper roll, a finely perforated gas pipe is now used; a row of minute gas jets supplies the requisite line of flame for singeing the passing cloth, and the cumbrous coal bed and cylinder are things of the past.

Blue or fuel water gas has also been considerably used in foundries, iron and steel and glass works, etc., for drying cores and flasks, plate welding and reheating, crucible melting and other purposes. Such industries, however, tend towards the use of large quantities of heat, and, while mechanically the work may be well done, economically it approaches the conditions wherein producer gas may be the cheaper to use. For drop or trip hammer forging, or other small high temperature forging or furnace work—in rivet, rod and nail machines, in pipe bending and all operations of similar magnitude, blue gas is at its best.

The use of "oil gas" or some form thereof, owing to the cheapness of petroleum and naphthas, has in recent years made very considerable progress in the arts. The term is elastic. The true oil gas, made from petroleum vaporized in retorts by heat, is a chemically fixed illuminating gas of very high candle power, with heating value unnecessarily good, and too expensive for mechanical operations. As ordinarily understood, "oil gas" is merely a mechanical mixture of air with oil vapor. A current of air is passed over or through suitable volatile oils, picking up so much vapor that the transportable mixture will burn with a moderate light and high heating effect. The Springfield gas machine for lighting isolated country houses is an old, though perfect, type of this. The "gasoline gas" or "greased air" product, as so made and popularly named, has practically all the characteristics and advantages of a gas, and for convenience sake is so designated. Apparatus for making it has been so perfected of recent years by the use of proper mechanical devices for insuring the uniformity and reliability of the product that to all intents and purposes such apparatus has become the equivalent of individual factory gas works suitable for affording a fluid fuel supply that will in many cases do the work done by natural, city, or blue gas, and with equal satisfaction and economy. Many such plants have been installed, particularly by metal working establishments, isolated from the use of the so-called regular, or true, gases. While for a trifling amount of heat it would not pay to install a plant for its manufacture, and for large operations the cost of any form of oil gas would exceed the cost of producer gas, there is yet an enormous field of medium mechanical operations for which it is suitable. Those applications already mentioned, involving high temperature work on a small scale, are representative. The manufacture of sewing machines and bicycles involves many specific applications. Dial and enamelled novelties, and gun work, where drop forgings are a principal feature, are other specific instances. Other applications are the manufacture of rouges and polishing compositions; the melting of copper in brass foundries; the manufacture of dentists' tools and of artificial teeth; muffle work; assaying and refining gold and silver; "sweep reducers" melting, and blowpipe work.

The heating value of the various oil gases differs widely, depending largely upon the design and efficiency of the producing apparatus. As made from naphtha on a high grade, typical, modern machine, its value is about 300 heat units per cubic foot, or about the same as that of blue water gas.

"Producer gas," by far the lowest in heating value of all commercial gases, presents a great contrast between its apparent relative worthlessness as compared with other gases, and its actual value for magnificent fuel economies in the largest manufacturing establishments, where its virtues are known and utilized. As ordinarily made, it has but one-fifth or one-sixth the heating value of city gas, or but 120 to 135 units per foot. More than one-half of it is incombustible nitrogen. It is utterly useless for illumination. It is so dull and inert that it cannot be easily lighted or burned if it has become cooled and lost the original sensible heat of the gas producer. It cannot be used in small quantities, or conveyed through small wrought iron pipes, or be piped around a town like other gases; and yet, despite all these apparent drawbacks, it is so cheaply and simply made, and so wonderfully effective when properly applied, that it has become the standard and only fuel in numerous industrial operations of the highest importance. These operations are at times spectacular, and always interesting. Limitations to the use of producer gas are that it must be used as made, and on a relatively large scale, and at a point practically adjacent to the place of manufacture. These limitations are not objectionable in large manufacturing plants, and many, by installing producer gas, have practically secured all the advantages of cheap natural gas. In competition with rivals in the natural gas field, the ability thus to secure so cheap a gas fuel is often a point of extreme importance. Producer gas, made up of carbonic oxide, hydrogen and nitrogen, is merely the blue gas of incomplete combustion often seen hovering over the top of domestic furnace fires. It is purposely made on a large scale from either buckwheat anthracite or cheap slack bituminous coals. Burned as it comes from the producer, it is so low in heating energy that it cannot be so used, except where moderate furnace heats are sufficient. By preheating the air used for combustion, however, by some system of recuperation, increased temperature can be secured; and if, by a full system of regeneration, the incoming gas and air are both preheated, as high a furnace temperature can be obtained as may be necessary for almost any kind of work. In the latter cases, moreover, for a given amount of work the amount of coal necessary, converted into and used as producer gas, is often but a half or a third that which would have to be used if directly burned. For such reasons it is by far the cheapest fuel, where large quantities of heat and white-hot temperatures are required, as, for instance, in steel works. For years it has been a standard part of such plants for firing open hearth furnaces, the heating of slabs and ingots, the melting of steel, etc. Glass manufacturers have also made most extensive use of it in both crucible and tank furnaces for melting purposes. That it is sufficiently efficient in this work, one can well believe when standing before a 60-foot furnace of molten glass, kept seething and surging under the radiant heat from a torrent of producer gas playing over it. In copper and silver mining districts—notably in Montana—for smelting and ore roasting, producer gas is largely used with especially marked success as regards evenness of temperatures and economy. The same is true for iron, zinc and other ore roasting. The modern method of steel making requires the reduction of the 2½ per cent. of sulphur often present in the ore down to about ½ per cent., before going to the smelting furnaces. The process consists of driving out the moisture by roasting, and producer gas is now practically the only economical way of accomplishing it. In the firing of pottery, terracotta and brick kilns, producer gas is also extensively used. In the char houses of sugar refineries, for the making of animal charcoal, it is becoming a staple fuel. In annealing furnaces in the manufacture of steel rope and malleable castings, and in brass and copper works, it is used in numerous instances. In city gas works it is often employed for firing the retorts that distill coal gas. In illuminating water gas manufacture it is used for heating the chambers necessary to fix and make permanent the petroleum vapors used for enriching. For the manufacture of enameled iron bath tubs, "granite" and other enameled iron ware, it is peculiarly adapted, giving a cheap and uniform heat for firing the muffle ovens which contain the goods.

In the Solvary Process works near Syracuse, and in other similar chemical establishments involving large operations or reductions by heat, it is used extensively. In short, wherever heat is required on a large scale, producer gas is generally the cheapest of all fuel as well as wonderfully effective and convenient.

One of its most interesting special applications is the tempering of steel guns at the Bethlehem Iron Works, South Bethlehem, Penn. The gun is hung within a vertical furnace, and upon it from all sides numerous jets of producer gas play, until the right temperature is reached. The gun is then transferred to an adjacent oil bath, plunged within, cooled, and tempered, precisely as a blacksmith tempers a fine tool. When it is stated that some of these guns weigh 25 tons each (40-ton ones are in prospect) and are 60 feet in length, and that both the furnace and the oil tank resemble in size the water tower of a small town, the magnitude of this industrial operation of tempering by gas may be realized.

Enough has been said to show that gas, whether of one kind or another, is used most extensively for industrial purposes, and that its use is evidently a factor of the highest importance to progressive manufacturers alive to the necessity of securing the greatest economy and all possible advantages in their fuel operations. And yet, extensively as it is used, and constantly increasing as its uses are, it is the opinion of the writer that the number of plants in which gas is so used does not constitute one-quarter of the number wherein it can, and ultimately will, be adopted to advantage. Whether it should be adopted or not by manufacturers not yet using it, need not be a matter of vague opinion; it is a matter susceptible of proof from practically exact figures. Hard fuel for any given heating operation now costs a certain amount. A given net amount of heating effect is secured from it, which can be closely calculated. The comparative cost of an equivalent net amount of heat secured from any one of the several commercial artificial gases mentioned is a matter of comparatively easy figuring to any one familiar with the nature of the work, the cost of the gas or gas-making materials, and the relative heating values and characteristics of the several gases. A manufacturer paying large sums per year for hard fuel who has not employed an expert to determine whether illuminating, blue, water, oil, or producer gas can advantageously displace that hard fuel is certainly running a large risk of conducting his business under a handicap of unnecessary fuel expense, compared with the possible lower cost of gas. In a surprising number of cases the figures will show that economy can be secured by intelligently substituting one of the gases mentioned, to say nothing of an increasing amount of product, a better grade of work, and other incidental advantages almost invariably secured.

The Evolution of Electric Lighting Fixtures.

[A paper read by R. M. DYER, before the National Association of Gas and Electric Fixture Dealers.]

To a manufacturer or dealer who entered the business after the present constructions had become standard, and without knowledge of the travail which preceded that result, electric and combination pendants appear to be only the ordinary gas fixtures with the wires and insulating joints added, and with such simple changes in construction as are required to accommodate these conditions. Back of this, however, there is a history which has never been and probably never will be fully written, and which is known only in part to those few manufacturers and dealers who participated in the early introduction of the incandescent electric lamp.

That lamp was invented by Mr. Edison in the summer and fall of 1879, and was publicly exhibited in operation on a considerable scale at Menlo Park, N. J., during the Christmas holidays of that year. The exploitation of this lamp as a substitute for gas for interior illumination was undertaken by The Edison Electric Light Company. During the year 1880 the only plant worth noting was that on the steamboat "Columbia," of the Oregon Navigation Company, plying between Portland, Oregon, and San Francisco, Cal. This boat had oil fixtures to which were added crude attachments for supporting incandescent lamps. The fixtures were made by Williams, Page & Company, of Boston, Mass. They were special constructions, which have never been repeated, and which furnish no indications of how to build pendants suitable for general use for the lighting of houses.

In February, 1881, The Edison Electric Light Company rented the dwelling house, 65 Fifth avenue, located on the east side of Fifth avenue, just south of Fourteenth street. It undertook to equip this building with a complete electric lighting plant which would show the possibilities of the incandescent lamp for interior lighting, both for offices and household uses. The rooms were to be provided with pendants corresponding in number and location to those which had been used in the house for gas, with a newel post standard, with a slide fixture, and with brackets. All these fixtures were for electric light only, no combination arrangements being included. The slide fixtures and the brackets were special constructions, and are not interesting for the purposes of this paper. The contract for these fixtures was given to Mitchell, Vance & Company on specifications furnished by The Edison Electric Light Company. Mitchell, Vance & Company did the metal work, and called in Mr. Charles R. Hinds, a gas lighting electrician of reputation, to furnish the electrical devices in accordance with the specifications. The fixtures were built on a patented idea of

Mr. Edison's involving the "knock-down" principle. They were brass-finished fixtures, of a selected design for gas work, and were provided with large bodies open at the bottom, and in these open bodies were located large circular blocks of vulcanized fiber, upon which the electrical connections were made. Each arm of the fixture was wired complete, and the wires terminated at the inner end of the arm in two insulated contacts corresponding in principle to the contacts on the base of an incandescent lamp. The block of vulcanized fiber secured in the body of the fixture was provided for each arm with a set of insulated contacts corresponding in principle with the contacts in a lamp socket. The object was to enable the connections between the arm wires and the main or stem wires to be made by simply screwing the arm in place, and thus the fixture arms could be wired complete and the fixture taken apart or "knocked down" for shipment without disturbance of the wiring. The fixtures were not provided with any main stem wires by the manufacturers. These were to be provided by leaving the wires projecting from the outlet of sufficient length to enable them to be drawn through the pendant to its lower end and there secured by screws to the proper contact plates on the blocks of vulcanized fiber in the bodies of the fixtures.

The arrangements just described were actually carried out, the main wires being passed through the outlets by putting in T-connections with the horizontal pipes in the ceiling, which T-connections had openings at the center of the T for permitting the main wires to be run directly down through the outlet. The fixtures were delivered on March 15, 1881, and Mr. Luther Stieringer, at that time employed by Mitchell, Vance & Company, was given the work of erecting the fixtures. Stieringer was to have nothing to do with the electric work; that was in charge of an electrician for The Edison Electric Light Company. Difficulties arising from bad contacts, ground connections, etc., were soon developed; and after considerable tinkering to overcome these difficulties, Stieringer, with the consent of the Edison Company, took out the electrical contrivances in the fixtures and rewired them on the simple plan, at present employed, of soldering and tapping the joints between the stem and arm wires, and to avoid still other difficulties he opened the line of piping back of each fixture, leaving an air gap which cut off the fixture from the ground formed by the house piping. The result was satisfactory, and the electrical difficulties disappeared.

From this work Stieringer was brought to an appreciation of the fact that if internally wired fixtures of the general design of gas fixtures were to be made useful and were to be supported from the house piping, as he believed they should be in the case of simple electric fixtures and knew they would have to be in the case of combination arrangements, it would be necessary to provide a device which should form an effective mechanical connection between the fixture and the outlet, and an effective electrical separation or insulation between those parts. This resulted in the production of the insulating joint, two forms of which (one adapted for electroliers and the other for combination fixtures) Stieringer made about this time, the work being done at night at his house. It was some time later, however, before he had an opportunity to put his ideas to the test of practice, but these insulating joints he carried around in his pocket and showed to various people in explaining his notions relating to fixture work.

During the year 1881, several manufacturing establishments were organized for making the various kinds of apparatus required for incandescent lighting by the Edison Company, and an effort was made to get one or more of the gas fixture houses to undertake the manufacture of electric fixtures. None of these houses was found willing to go to the expense of developing the new forms and devices which would be presumably required, while they were quite willing to do work at the risk of the purchaser in accordance with specifications which might be submitted to them. Their position was thought by the electric light men to be antagonistic to the new industry, and perhaps it was, in the sense that there was no certainty that the new illuminant would furnish them with the same business opportunities as did the gas which it would replace; and, naturally enough, gas fixture manufacturers with an established line looked upon the new industry as involving experimental expense without an assured outcome.

In this situation the firm of Bergmann & Company was organized and a small shop established for the manufacture not only of fixtures but of miscellaneous small devices, such as sockets, safety catches and switches, which were not within the scope of the other Edison factories. That firm undertook the electric fixture business on lines quite independent of the gas fixture art. Their first pendants consisted of a simple iron pipe for the stem and a large cast iron body open at the bottom, in which the arms were screwed. The iron was given a bronze finish, and the bottom of the body was covered with a hard rubber cap, which, being black in color and presenting a different appearance from the finish of the fixture, was painfully conspicuous. A large block of wood was set in the body, and on this block were mounted plates to which the arm and stem wires were screwed. Circuit controllers having stems projecting through the hard rubber cap were also mounted on this block, as well as safety catches. These fixtures were provided with a crowfoot or with an equivalent device in the form of a closed cast iron canopy with a flange for fastening screws; and whether provided with the crowfoot or the flanged canopy, the fixture was designed to be secured to a large base of wood, which, in turn, was attached to the ceiling. The fixture as manufactured was wired complete in the arms, but the stem wires were omitted and were designed to be provided by wires extending from the ceiling which were to be drawn through the stem of the fixture and secured at their ends to plates on the wooden block in the body.

An improvement upon this construction introduced by Bergmann & Company was a similar fixture provided with stem wires which ended in a large plug attached to the top of the stem, this plug being similar to the base of the lamp, or to an attachment plug such as now employed, but made of wood and several times larger. To the ceiling was attached a large circular block of wood having a socket corresponding to the lamp socket, in which the ceiling wires terminated. By this plan a building could be wired complete, the wires terminating in the sockets in the ceiling blocks, and the fixtures could also be wired complete and could be attached in place by simply screwing the plug on the end of the fixture to the socket in the ceiling block, making at the same time a mechanical and an electrical connection.

A number of fixtures of the two kinds described were manufactured and shipped to the Paris Exposition in 1881, and a few, particularly of the kind supported by the crowfoot or flanged canopy, were put into use in this country. During this time electricians who did not care to use the Bergmann fixtures supported their lamps by means of such expedients as came to hand. Some gas fixtures were used with wires wrapped around the outside or carried to the lamps aerially, and in some instances a partial concealment of the wires was effected; but nothing in the way of a standard of construction was adopted except in the case of those fixtures manufactured by Bergmann & Company.

In the fall of the year 1881, Stieringer wired and hung, in accordance with his own ideas, electric light fixtures in the house of Mr. J. Hood Wright, in New York city, and in the spring of 1882 did similar work in the house of Mr. J. W. Doane, of Chicago. Both Mr. Wright and Mr. Doane were interested in the Edison business. Having thus demonstrated to his own satisfaction the success of his plan of using internally wired gas fixtures supported by insulating joints, Stieringer applied for his patents covering the use of the insulating joint in connection with electric and combination fixtures of this character. His work, however, had not so strongly impressed the electric light people as to effect a change in the character of the fixtures manufactured by Bergmann & Company.

The recognition of the merit of gas fixture designs for electric fixtures, and of Stieringer's method of using them, was of slow growth, and only came about by the gradual introduction of the incandescent lamp for interior illumination in locations where the users would not consent to the lack of ornamentation and artistic effect which had become a standard in connection with gas lighting. As the business grew, the frequency with which fixtures of this class were required and the dangers from fire which their use involved, brought the subject to the attention of the fire insurance interests, who formulated rigid rules as to the separation of wires carrying the electric lighting current from each other and from other conducting bodies, which, if enforced, would have prohibited the use of internally wired metallic fixtures. Indeed, the insulated wire at that time on the market was quite unsuited to the work, and it is questionable whether the fire insurance underwriters would ever have permitted the internal wiring of metal fixtures as a regular practice if improved forms of insulation had not been developed.

Stieringer's plan of introducing an insulating joint between the fixture and the outlet reduced the danger considerably, and in 1884 the New England Insurance Exchange adopted a rule requiring the employment of insulating joints when fixtures were hung from grounded supports. This requirement, which was adopted later by fire insurance underwriters throughout the country, together with the improved forms of insulated wire which were developed, resulted in the general adoption of the present standards of construction in the electric fixture business, and the gas fixture manufacturers, commencing first with the larger houses and extending subsequently throughout the trade, took

up the manufacture of electric and combination fixtures as a part of their regular business.

A review of the entire situation shows that it was the insulating joint and the ideas involved in its use which led to the present universal employment of gas fixture designs for electric and combination fixtures. Without the insulating joint, a form of insulated wire having a high insulation, protected mechanically by some armor which would prevent abrasion, might have been finally developed, and would have enabled the safe internal wiring of metal fixtures without the use of the insulating joint. Such an improved insulated wire might have been produced as the result of the pressing demand for it in the absence of the insulating joint; but it is apparent that, with the imperfect insulations which existed in the early days of the electric lighting art, and which still exist, the insulating joint is the foundation upon which the present electric fixture art rests. That joint and its use in this connection were invented by Stieringer, and are covered by his patents, to which, in view of the meritorious results accomplished, full credit should be given.

To this very complete statement by Mr. Dyer may be added the fact that Mr. Maitland bought into the Stieringer patents in 1888. It is expected to have the suit against the Goetz Company argued at final hearing in the Circuit Court in New York early in the fall. Whichever way the case is decided, it will undoubtedly be appealed in the Circuit Court of Appeals for that circuit. When that Court will decide the case cannot now be determined. The earliest possible date is about the end of the present year. When that decision is given it will be the "ultimate" decision for that circuit, and probably for other circuits.

A Difference in Hydraulic Mains.

[A paper read by MR. P. EGAN, of Tralee, at the last meeting of the North of Ireland Association of Gas Engineers.]

Having been requested to contribute a paper to this meeting, it occurred to the writer, when looking for a subject, that any trouble arising in the retort house, no matter how apparently trifling, should not be allowed to pass unnoticed, as, of course, any defect in this very important part of the plant may interfere seriously with the successful working of the whole concern, especially in the case of small undertakings. For this reason, and with the view of leading others to give their experience, he has brought the matter forward.

When the writer took charge of his works, the retort house contained four beds of five retorts, each 22 inches by 15 inches, and 7 feet 6 inches long, with 5-inch ascension pipes, tapering to 4½ inches at the top, and 4-inch H-pipes, all connected to a cast iron hydraulic main 36 feet long and 16 inches in diameter, with one 5-inch outlet at the end for gas, tar, and liquor. A piece of 1-inch gun barrel pipe, with a stop-cock, was screwed into the side, and led to the tar well. Presumably this was intended to lower the seal of the dips, which, it must be admitted, they in certain cases badly needed, as some of them were found to have a tar seal of 3½-inches. One of these beds was continually giving trouble with stopped ascension pipes. So in the following year one half of the hydraulic main was disconnected and taken down, some new stands procured, and properly levelled, and this half connected again with only two beds of retorts. The other half of the main was treated in the same way the next year, and a new outlet pipe attached at the end, and connected to an 8 inch foul main passing round the house on its way to the condensers. The result was complete freedom from trouble with stopped pipes in those beds.

Some time afterwards, it became necessary to erect two new additional beds of retorts at the opposite side of the house. The retorts were 24 inches by 15 inches, and 8 feet long, set five in each bed, with 6 inch ascension pipes tapering to 5 inches, and 5-inch H-pipes; the hydraulic main being ⊔ shaped, 18 feet long and 22 inches in diameter, made of wrought iron plate ⅜ inch thick, and connected to the 8-inch foul main. Everything being new, these two beds could not be got to heat very satisfactorily for the first three or four seasons. Therefore, when next the retorts were renewed, it was determined to have a change. Then some alterations were made in the settings; the exit-flue on the crown of the arches being closed, and new uptake-flues built in the back wall with dampers on the top. The heats then became excellent; but a very unpleasant change took place in the form of choked ascension and bridge pipes. These, however, were easy to clear, and the trouble caused was trifling in comparison with what was in store; for in a short time the hydraulic main itself became choked with thick tar and pitch, which blocked up the mouths of the dips, and on several occasions as many as four out of the ten retorts were stopped in this manner. It was anything but pleasant on a winter's evening, when perhaps the full number of retorts at work are required.

In order to clear the main, it was necessary to make a large hole in the retort house wall to get the end plate taken off, as it was of no use to drive bars down through the dip-pipes. When this was done, the main was found to contain very little liquor, but a mass of pitch and very thick tar, which proved rather difficult to remove, as it stuck so fast to the iron that the chisel-pointed bars used to glance off the hard portion of it. A jet of steam was laid on to it; but this was found to be too slow. Then a couple of strong gas flames, burning from the ends of a length of pipe, and connected by a flexible tube with the nearest gas supply, were applied to the bottom of the main in different places. This heated the iron so that the pitch loosened, and could be drawn out in large masses by means of a rake.

This clearing of the hydraulic main had to be done every six or seven weeks, until the beds were let down. Then a tar outlet was put on at the end. It was made of 3 inch gun-barrel bends and T's, formed into a trap, with the end projecting through the wall, where it dropped the tar and liquor into a rain water hopper-head fixed to the wall, from which they were conveyed by a 3 inch pipe to an iron store-tank, where they were separated. This tank serves for filling the barrels; it being raised from the ground on stands. A ¾-inch water supply was then connected to the other end of the main, with a regulating tap within easy reach of the stokers, and a constant stream of water kept running through it. This keeps the dips and H-pipes cool, and brings away the tar while it is in a soft and thin state. Any stoppage or check in this arrangement can be readily detected, as the tar and liquor can be seen flowing into the hopper from the retort-house door. This, however, has not occurred since it was put on. The whole thing works most satisfactorily; a constant water-seal being maintained, which can be regulated to any required depth.

In conclusion, the writer would remark that the difference still exists between these two hydraulic mains, that the old section at the other side of the house never chokes or collects pitch in the manner described, though the heats have been just as good. But the charges are not quite so heavy; the retorts being somewhat smaller. Then the extra thickness of metal in the old pattern main seems to keep the tar cooler, and prevents it from forming into pitch, as the heat does not penetrate it so quickly.

Discussion.

The Chairman said they had listened to an excellent paper by their friend from Tralee. It was very good to see a manager coming such a distance, and giving the Association such an excellent paper.

Mr. W. Miller (Cookstown) asked what sort of coal was in use when the hydraulics were fixed up. Was it the same as was in use before? And what was the thickness of the wall? Frequently the wall was very thin. He had seen 4½-inches; and they knew the heat it had to stand was very great. With walls 9 inches, and even 13½-inches thick, he had occasionally had stopped pipes. He had found one pipe stop when he could not explain why it had done so. There was only one in the whole place which stopped; and the way he cured it was by a little jet of water and dropping some asbestos down it. He let the water enter through a very small orifice—a gas burner, in fact. He presumed that the author of the paper did not do anything with his gas liquor, because he understood he was sending in ordinary cold water into the main, which would make the liquor valueless. But probably, like himself, he could do nothing with it.

Mr. D. Williamson (Clones) asked what height the mains were. Were they both the same height? and did he understand from Mr. Egan that the one was a ⅜ inch wrought iron, and the other a cast iron pipe?

Mr. Egan said that, with regard to the coal used, he might mention that, in the beginning of this trouble, it was English coal he was using; but before they had got over it, they had changed to Scotch coal. The trouble was, however, just as bad with it. The sort of coal used did not seem to make any difference. The front walls of the two benches were 9 inches thick. He would not mind very much a few pipes choking; but in his case the hydraulic main was simply blocked up with pitch. That was his trouble. He did not make any use of the liquor from the main. Even if he did lose it, he considered that a desperate case required a desperate remedy; and he was prepared to sacrifice the liquor for the sake of the main, because it was in the midst of the winter time. Those were the principal retorts he had in use at the time. The height of the main was the same in both sections. The main in the old section—the cast iron one—was much thicker than the new one. It was more troublesome. The old section was circular; the new section was U-shaped.

Mr. Miller said that the reason he asked about the coal was that just

about a year before, he was concerned, in his present works, with a coal from Wigan which was brought in, and it pitched the main in just the same way. The pitch had to be dug out with spades; and he never could find out why it did pitch.

Mr. Egan—Our difficulty was the same with both kinds of coal.

Mr. T. Hands (Enniskillen) said he would like to make a remark regarding an experience he had had, as to the pitching of a main. The main was very low; and the arch had been put up perhaps a good many years before. It was only of 4½-inch firebrick, backed up with 4½ inches of red brick; and it was very poorly filled in. The main pitched up; and they had to dig it out. He put on 9 inches of brick rubble along the wall in front, and filled it in with lime; and as it heated up, the lime ran into the brick rubble. By this means, the hydraulic main was heated up; and he never had any difficulty with it afterwards. Want of heat was the trouble with him.

Mr. G. Norman (Dublin) said he believed that the pitching of the main was more likely to occur with regenerative furnaces than with the old direct form of firing. At Athlone, where they had Hislop's regenerative furnaces, it took about two days to put things right.

Mr. R. Ross (Dungannon)—But in Athlone the bridge pipes are outside the roof altogether.

The Chairman said he had no doubt they had all had their own troubles with pitched mains and choked ascension pipes; and he did not know if a cure had yet been found for them. Everybody thought his own was the cure. He (Mr. Nesbit) thought, however, it was understood that pitching was caused by an extra strong heat coming off the bench; and in his opinion about the best cure was to keep the hydraulic main pretty high above the brickwork.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. George F. Summers has been appointed Superintendent of the gas department of the Hackensack (N. J.) Gas and Electric Company.

The proprietors of the Logan Iron Works, Brooklyn, N. Y., are under contract to build a relief holder for the water gas plant which the Bridgeport (Conn.) Gas Light Company has determined to construct. The holder is to have a capacity of 40,000 cubic feet. The same contractors will also erect a storage oil tank for the Bridgeport Gas Light Company, the tank to be equal to holding 75,000 gallons of oil.

At the annual meeting of the Malden and Melrose (Mass.) Gas Light Company the officers chosen were: Directors, George W. Walker, W. B. Buckminster, Frank E. Chandler, Everett J. Stevens, John A. Coffin, E. A. Stevens, Jr., Daniel Russell and V. W. Mason; President, George W. Walker; Vice-President, W. B. Buckminster; Clerk and Treasurer, V. W. Mason.

A correspondent at Victoria, B. C., writing under date of August 22nd, says: "Not long ago a special meeting of the Vancouver City Council was held to consider a proposition for the purchase by the city of the plant of the Vancouver Gas Company, Limited. Mr. Gideon Robertson, who appeared for the Company, stated its position. The Company, he said, owned 12 city lots, on which site stood a well-built gas works, fully up to any demand that might be made upon it for it, gas by the residents of the city. There were 15 miles of mains, and 609 meters were placed and in use. With regard to the financing of the Company, Mr. Robertson said there were two issues of debenture bonds. The first issue was of $50,000, at 6 per cent., interest payable half-yearly in August and February; $1,000 had been already paid on this, so that on $49,000 all the interest had been paid, and the principal was due in February, 1898. The second issue was for $150,000, at 6 per cent. for 5 years, of which $96,500 was outstanding. The principal was due on the 1st of November of next year. The total indebtedness of the Company was thus $145,500. The speaker had submitted an offer to London, where he believed the value of such plants could be figured almost to the dollar by experts, and he had an offer, which was now good, for $125,000 in cash, the London people to assume the indebtedness of $145,500, making a total of $270,500. If the works were sold to the London people, a commission would have to be paid, and the offer to the city was at $265,000, or $5,500 less than the offer from London. The Aldermen discussed the proposal and finally decided by resolution that they would not recommend the purchase under the conditions named."

The same correspondent adds that the affairs of the New Westminster (B. C.) Gas Company are to be "officially wound up," by the appointment of a receiver.

Secretary W. A. Aldrich, of the Spokane Falls (Wash.) Gas Light Company, is our authority for the statements that the business of the Company is steadily growing larger. Over 60 per cent. of the Company's patrons use gas for fuel, in one way or another. Welsbach burners to the number of 5,000 were placed during the twelvemonth. Since January 1st the Company laid 2½ miles of new mains, and furnished service pipes to 73 new houses. The increase in sendout amounted to 44 per cent.

Mr. Edwin W. Pratt has resigned from the service of the Los Angeles (Cal.) Lighting Company.

The plant and property of the Birmingham (Ala.) Gas Company stands on the city assessment rolls, for purposes of taxation, at $28,000.

The new gas rate at M'Keesport, Pa., of $1 per 1,000 cubic feet, less 10 per cent. for prompt payment, is now in effect.

At the annual meeting of the Concord (N. H.) Gas Light Company, a semi-annual dividend of 3 per cent. was declared, and the following officers were chosen: Directors: L. D. Stevens, John Kimball, Henry McFarland, John P. George, J. M. Mitchell, Benjamin C. White and F. A. Stillings; President, L. D. Stevens; Clerk, Sylvester Dana; Treasurer, Jno. Kimball.

Mayor Todd, of Louisville, Ky., in his annual message, had this to say about the city's interest in the shares of the Louisville Gas Company: "It is not generally known that the city of Louisville owns one-fourth of the stock of the Louisville Gas Company, or, in round numbers, $925,000 worth of stock. So far it has been a good paying investment for the city—in fact, about as good as can be had in those parts. It is true there was a slump in the price of stock during this year, and there was also a feeling of trepidation among the holders, but since the examining committee made its report the tendency of the stock has been upward. I understand there is a syndicate which offers to pay $110 per share for all available stock. This is a very reasonable offer, but it is questionable if, even at that figure, we can dispose of our holdings. I had the honor to be designated as a member of the investigating committee which recently examined into the affairs of the Company. The committee had the benefit of the services of an expert gas accountant, and together we probed the affairs of the Company to the bottom. At the conclusion of the investigation we made our report to the stockholders and directors. In this report we outlined the condition of the entire plant, and made certain suggestions, all of which will likely be adopted. Among other things we recommended that a dividend of 2 per cent. be declared at once; accordingly a dividend was paid under date of July 1, and the city has been credited with $18,500 on its bill for public lighting this year. Speaking of being credited with $18,500 reminds me that there is a peculiar feature with our relations to the Louisville Gas Company, namely: The Louisville Gas Company, by an act of the Legislature, granting a charter to said Company, is made the custodian of the city's stock in the concern. Acting on this authority, they not only keep the city's ledger pertaining to the operations of the Louisville Gas Company, but they have taken a step in advance of this, and they assume that being qualified as custodians, they have a perfect right to handle our stock as if it were their own. This means that they consider it their prerogative to take such action in relation to our stock as they see fit, whether or not such action is contrary to the expressed wish of the executive or legislative branches of the city government. The effect of this is peculiar, in that, while the city actually owns the stock, it has no voice in the management of it, except through the four men whom the Council elect annually to serve as Directors of the Louisville Gas Company. As the Directors elected by the Council form only one-third of the whole body, it is apparent that our interests would suffer if a combination were formed against us in the directory. To illustrate our helplessness, we will suppose that the General Council and the Mayor desired to sell the stock of the city to the syndicate now seeking control of the plant and an ordinance or resolution should be passed demanding that the stock should be sold; we will suppose, too, that a majority of the directory of the Louisville Gas Company are opposed to the sale. Now, the Louisville Gas Company, being the custodians of the city's stock, also being in full charge of the plant, refuse to issue certificates to the syndicate for the stock—how, then, could the transfer be made? I contend that the principle is wrong and that it should be changed at once. If it be true that the Legislature has clothed said Company with authority to manage or dispose of our interests, I think the charter which grants the Gas Com-

pany this right should be amended, so as to take away from said Company the control of our property."

At the annual meeting of the Rockville (Conn.) Gas and Electric Company, held in Rockville on the 6th inst., the following officers were chosen: President, A. M. Young; Vice-President, George E. Terry; Treasurer, F. W. Marsh; Secretary and General Manager, D. F. Burritt.

The work of building the entire plant for the Newport News (Va.) Gas Company has been intrusted to the United Gas Improvement Company. The contractors will install one of their standard sets of double-superheater, Lowe water gas apparatus, with a daily capacity of about 125,000 cubic feet, the rest of the contract calling for the entire equipment of a modern gas works, the apparatus to include an exhauster, station meter, purifiers and storage oil tank. The relief holder system will be used. The work will be pushed rapidly, and it is thought that Newport News will have gas before Christmas time.

The Philadelphia Gas Improvement Company, of Philadelphia, Pa., is increasing its plant by the erecting of a new fireproof pipe shop, constructed entirely of iron. The structure is to have a steel framework with a corrugated iron covering. The contract for erecting the structure has been let to the Berlin Iron Bridge Company, of East Berlin, Conn.

A Correspondent at Salt Lake City, Utah, forwards the following under date of the 2d inst.: "While it has been generally understood that yesterday was the time set for the formal transfer of the various electric light, gas and power plants to the Union Light and Power Company, the legal conveyances have not yet been filed for record. The consolidation will undoubtedly be perfected in name as well as in fact within the next few days. General Manager Campbell says that no complications have arisen and that none are likely to crop out to the disadvantage or hindering of the plans that are being perfected. In fact, the pursuit of policies on lines harmonious with the contract of consolidation is in process, and the management will soon be able to inform the public that the merging of interests will result in vastly improved service at lessened cost to the consumers, meanwhile preparing for increased benefits by way of cheaper operating expenses to the integral parts of the combination. Manager Campbell also stated that if there were any embarrassments of a legal nature affecting the contract obligations of the Salt Lake and Ogden Gas and Electric Light Company or the companion corporations, he was certain they were so slight that a few days' time would remove them. The consolidation is of such magnitude that the perfecting of details will probably require a little more time than was estimated. At any rate it can apparently be relied upon that there is no hitch in the deal now or in prospect, and a few days hence will see the concentrated energy of the Big Cottonwood and Pioneer Companies delivered from the Citizen Company's central station.

The company supplying natural gas in the Richmond, Ind., district has notified the residents that those who use the gas for illuminating purposes will hereafter be obliged to pay 20 cents per 1,000 cubic feet for such service. This is an increase of 7½ cents per 1,000.

At a meeting held to complete the reorganization of the gas and electric lighting interests of Elyria, Ohio, the following officers were named to manage the affairs of the combined properties: President, W. G. Sharp; Vice President, A. L. Garford; Treasurer, J. C. Hill; Secretary, R. T. Reefy.

The Westmoreland and Cambria Natural Gas Company has discontinued its offices in Johnstown, Pa.

Press despatches from Chicago are to the effect that last Monday the property of the latest gas enterprise at Waukegan, Ills., known under the title of the Pipe Line Service Company, would be sold at auction. The "property" included a site on the Lake front, "some miles" of buried gas mains, and a doubtful franchise.

The proprietors of the Wilmington (N. C.) Gas Light Company have announced their rate schedule for a supply of current to incandescent electric lamps maintained in the center of the city. The rate is said to be 25 cents per lamp (16 candle power each), from dusk to 11 P.M.—save Saturday, when current will be kept on till midnight—per week.

A correspondent at St. Paul, Minn., writing under date of Sept. 6th, incloses the following: "President Benson of the St. Cloud (Minn.) Water, Light and Power Company, which has been in the hands of a receiver for some time, issued a call for a special meeting of the shareholders, to be held under the authority conferred by the by-laws, for September 9th, at which it is proposed to take preliminary steps in line of reorganizing the Company on a substantial basis. The Water, Light and Power Company is the corporation which owns the properties of the gas and electric light companies, also the possessions of the water power and mill companies. The main matter proposed for consideration is the surrender by the mill company to the other members of the corporation its only asset—a dam."

Here is a sample of a neat plea that was offered by a gentleman in excusing himself for using gas for which he had not paid: "Among the callers upon the County Attorney, of Butte, Montana, some days ago, was the Secretary of the Butte Gas Light and Coke Company, who informed Assistant County Attorney Connolly that, under the orders of the Company, he desired a warrant for the arrest of Philip J. Harrington. The latter was charged with violating a law passed by the Fifth Legislative Assembly for the protection of gas companies. He explained that Mr. Harrington, who used gas in his place of business, had, for the purpose of defrauding the Company, detached the meter and connected the inlet and outlet pipes with a piece of rubber hose, through which the gas flowed without the formality of being registered. The Secretary admitted that he did not know how long the bye passing had been going on, but the fact that it had been occurring was detected three days before the complaint was made. The Secretary (Mr. Williams) said when the attention of Mr. Harrington was called to the existing state of his gas supply, Harrington replied all he knew about it was this: The meter had been leaking and he had called in a man to repair it. The workman said he could fix the meter so that the cost of gas thereafter to Mr. Harrington would be less than it had been theretofore, the price of the fixing to be $10. Mr. Harrington instructed the man to fix the meter, which was done, and the $10 was paid. That was all Mr. Harrington knew about it. For his ignorance Mr. Harrington will be formally tried, Justice Laurandeau having issued the necessary warrant."

Secretary J. W. R. Cline, the clever and capable managing man of the Springfield (Ohio) Gas Company, now rejoices in the direction of a plant that is quite well up to the demands for gas of General Bushnell's progressive city. The scheme of improvement completed this summer included a large addition to the storage capacity and a notable extension to the Company's main system.

A recent incorporation is that of the International Standard Gas Manufacturing Company, of New York City, which proposes to license sub-corporations to manufacture and dispose of "patented" gas machinery. The incorporators are William H. Russell, of Hasbrouck Heights, N. J.; W. B. Wigg, of Paterson, N. J.; J. C. Beekman, of New York City; and George E. Russell, of Nyack, N. Y.

Diagonal Joints for Boilers.

A contributor to a recent number of *The Locomotive*, in an interesting article upon diagonal joints for steam boilers, with a study of their strength as compared with longitudinal and circumferential seams, says:

"There is still much to be learned about diagonal joints. We need tests of them, made on a large scale, so that we may know exactly how the plates will behave under the oblique stresses to which they are subjected. The only published experimental data that we recall at the present writing are those relating to a test made in England, about 25 years ago, by Mr. Kirkaldy. He made up two single-riveted joints of iron plate, .38 inch thick, and having a tensile strength (with the grain) of 39,380 pounds per square inch.

"One of these was an ordinary square joint with six $\frac{7}{16}$-inch rivets, pitched 2 inches from center to center. The other was a similar joint, except that it contained 8 rivets, and was inclined at an angle of 45° to the direction in which the stress was applied. In the tests, the square joint gave an efficiency of 48 per cent., while the diagonal joint gave an efficiency of 64 per cent. In other words, the tests showed that the diagonal joint was stronger than the square one in the proportion of 64 to 48; that is, it was 1.33 times as strong. Our table indicates 1.27 as the theoretical ratio in this case. This is as good an agreement as could be expected, but more expansive data would be very acceptable."

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MONDAY, SEPTEMBER 13, 1897.

Profits of a Coal Tar Industry.

The London *Journal* "notes" that according to a statement of Dr. Otto N. Witt, President of the German Society for the Protection of Chemical Interests, the chemical industries of Germany are in a generally prosperous condition. None of them, however, pays so well as the coal tar color manufacture; the average dividends declared in this trade between 1886 and 1895 being 19.2 per cent. The average dividend of the coal tar dye industry has increased without a break, and with remarkable equality, since 1886. In that year, the average was not quite 10 per cent.; in 1891, it was upwards of 20 per cent.; and between 1892 and 1895, it has been 23.45 per cent. Unfortunately, there are no means of showing what proportion of this increased profit belongs to the coal tar remedies, which are now made at most of the coal tar products factories with at least as much assiduity as the manufacture of colors.

On the other hand, it is asserted that the burdens on the industry, in consequence of enforced contributions towards the insurance of workmen, etc., are increasing every year. Wages have also risen considerably since 1886; so that, for one reason and another, the advantage of cheap labor hitherto enjoyed by the chemical industry of Germany tends to disappear, and the time is approaching when the skill of German chemists alone will avail to retain this lucrative trade in the country. It will then appear whether or not the vaunted superiority of German technical training is really good for anything at all.

The Market for Gas Securities.

Comparative uncertainty is the outlook this week over the point that Consolidated gas will eventually reach, the market for it having been feverish, although the pulsations were continually to the increasing point. The high rate for the week was 220, with considerable realizing this afternoon (Friday), which bruoght the price back to 217. The plan of union respecting the agreement to amalgamate the properties of the Equitable Gas Light Company and the New York and East River Gas Company, shows the basis on which to estimate the eventual outcome of the union of the city's gas interests. Presuming that the existing common of East River is to be exchanged at par for the future common of the succeeding Company, the street rate for existing East River common should be a fair guide as to the first value of the new general common. The street estimates East River common, ex rights, to be worth 86, wherefore new common should be worth a like sum.

Under this construction, Consolidated gas should be worth 286, provided that the writer is not far wrong in his thought regarding the value of the senior securities that will be offered in exchange for original Consolidated. In any event no mistake can be made through buying Consolidated at anything under 225. All gas shares seem to be suffering from the climbing fever, and in several of them false values have undoubtedly been made. However, 'tis better to carry a palsied gas stock than a vigorous electric lighting security. Chicago gas is buoyant, and Brooklyn Union is in the same category, the closing to-day having been made at 126 to 126¼. Baltimore gas is strong, and Bay State is weak; but we imagine that the latter will do to hold. The general situation is favorable.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

SEPTEMBER 13.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	219⅛	220
Central	500,000	50	195	..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	295	297
Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	315	325
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
Northern	150,000	50	85	
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	85	87
Preferred	2,000,000	100	117	117½
Bonds 1st 5's	3,500,000	1,000	112	113
" 1st Con. 5's	1,500,000	..	105	106⅛
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	145	147
Preferred	5,000,000	100	155	157
Bonds, 1st Mortgage, 5's	1,500,000	1,000	114	115
Yonkers	299,650	50	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	122	122¼
" " Bonds (5's)	15 000,000	1,000	113	113¾
Bay State	15,000,000	50	12¾	13
" Income Bonds	2,000,000	1,000	..	35
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	93	..
2d " " "	3,000,000	1,000	80	81
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co.	25,000,000	100	105⅝	105¼
Chicago Gas Lt. & Coke Co. Guaranteed Gold Bonds.	7,650,000	1,000	104	104¼
Columbus	1,069,000	.	90	91
1st Mortgage	1,085,000	..	..	96
Consumers, Jersey City	2,000,000	100	78	77
" Bonds	600,090	1,000	101⅛	103
Cincinnati G. & C. Co.	8,500,000	100	203	203¼
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	1,000,000	100	59½	60
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000	.	50	50½
" Con. Bonds	4,312,000	..	92	92½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	83	84
" Bonds	2,000,000	..	93	95
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	152	155
" Bonds, 6's	2,650,000	..	107	109
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind	1,000,000	100	88	89
Bonds	1,000,000	1,000	92	94
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	45	45¾
Preferred	2,500,000	100	93	98
Bonds	9,034,400	1,000	103	..
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co.	1,000,000	..	142	..
Bonds, 6's	4,000,000	..	123	..
New Haven	1,000,000	25	225	..
Oakland, Cal.	2,000,000	..	53½	54
" Bonds	750,000	..	..	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	83	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	94	94½
St. Paul Gas Light Co.	1,500,000	100	49	51
1st Mortgage, 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	.	88	90
Syracuse, N. Y.	500,000	25	..	..
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	87	88
Bonds, 5's	3,556,000	.	98	100
Wilmington, Del.	550,000	50	200	202

Advertisers' Index.

GAS ENGINEERS.

	Page
Wm. Henry White, New York City	435
Fred. Bredel, Milwaukee, Wis.	420
Geo. R. Rowland, New York City	435
The Western Gas Construction Co., Fort Wayne, Ind.	426
Humphreys & Glasgow, New York City	422
American Gas Co., Phila., Pa.	430
David Leavitt Hough, New York City	427
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	435

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md.	433
United Gas Improvement Co., Phila., Pa.	425
Burdett Loomis, Hartford, Conn.	434
National Gas and Water Co., Chicago, Ills.	427
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	435
The Western Gas Construction Co., Fort Wayne, Ind.	426
Humphreys & Glasgow, New York City	422

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City	436
Continental Iron Works, Brooklyn, N. Y.	434
Deily & Fowler, Phila., Pa.	436
Kerr Murray Mfg. Co., Fort Wayne, Ind	432
Stacey Mfg. Co., Cincinnati, Ohio	435
Bartlett, Hayward & Co., Baltimore, Md.	433
Davis and Farnum Mfg. Co., Waltham, Mass.	432
R. D. Wood & Co., Phila., Pa.	434
Isbell-Porter Company, New York City	434
Fred. Bredel, Milwaukee, Wis.	420
United Gas Improvement Co., Phila., Pa.	425
Berlin Iron Bridge Co., East Berlin, Conn.	422
National Gas and Water Co., Chicago, Ills.	427
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	425
The Western Gas Construction Co., Fort Wayne, Ind.	426
Humphreys & Glasgow, New York City	422
Gas Engineering Co., Pittsburgh, Pa.	432
American Gas Co., Phila., Pa.	430
Logan Iron Works, Brooklyn, N. Y.	436
Riter & Conley, Pittsburgh, Pa.	419

SCRUBBERS AND CONDENSERS.

G. Shepard Page's Sons, New York City	435
R. D. Wood & Co., Phila., Pa.	434
James R. Floyd & Sons, New York City	436
Continental Iron Works, Brooklyn, N. Y.	434
Gas Engineering Co., Pittsburgh, Pa.	432
Logan Iron Works, Brooklyn, N. Y.	436
Riter & Conley, Pittsburgh, Pa.	419
Kirkham, Hulett & Chandler, London, Eng.	419

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md. 433
Fred. Bredel, Milwaukee, Wis. 430
J. H. Gautier & Co., Jersey City, N. J. 430
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. 430
Adam Weber New York City 430

TAR AND CARBONIC ACID EXTRACTOR.

G. Shepard Page's Sons, New York City. 435
R. D. Wood & Co., Phila., Pa. 434

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich. 417
G. Shepard Page's Sons, New York City. 435
Gas Engineering Co., Pittsburgh, Pa. 432

GAS METERS.

John J. Griffin & Co., Phila., Pa. 400
American Meter Co., New York and Philadelphia. 439
Helme & McIlhenny, Phila., Pa. 439
D. McDonald & Co., Albany, N.Y. 389
Nathaniel Tufts, Boston, Mass. 438
Maryland Meter and Mfg. Co., Baltimore, Md. 438
Metric Metal Co., Erie, Pa 358
Keystone Meter Co., Royersford, Pa. 438
Buhl Stamping Company, Detroit, Mich. 439

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia 439
John J. Griffin & Co., Phila., Pa. 400
D. McDonald & Co., Albany, N. Y. 439
Helme & McIlhenny, Phila., Pa. 439

GAS AND WATER PIPES.

Ohio Pipe Co., Columbus, Ohio 437
M. J. Drummond, New York City. 437
R. D. Wood & Co., Phila., Pa. 434
Warren Foundry and Machine Co., New York City. 437
Donaldson Iron Co., Emaus, Pa. 437

PIPE CUTTERS.

The Anderson Pipe Cutter Co., Marlboro, Mass. 419

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, Brooklyn, N. Y. 437

GAS COALS.

Penn Gas Coal Co., Phila., Pa. 429
Perkins & Co., New York City 428
Despard Gas Coal Co., Baltimore, Md. 429
Westmoreland Coal Co., Phila., Pa. 429
Berwind-White Coal Mining Co., New York and Phila. . . . 428
W. D. Althouse & Co., Phila., Pa. 429

CANNEL COALS.

Perkins & Co., New York City 428
W. D. Althouse & Co., Phila., Pa. 429

GAS ENRICHERS.

Standard Oil Co., New York City 429
The Sun Oil Co., Pittsburgh, Pa. 429

COKE.

Pittsburgh Gas and Coke Co., Pittsburgh, Pa. 417

COKE CRUSHER.

C. M. Keller, Columbus, Ind. 429

CONVEYING MACHINERY.

C. W. Hunt Company, N. Y. City 418

GAS GAUGES.

The Bristol Co., Waterbury, Conn. 418

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 427
Isbell-Porter Co., New York City. 434
The Wilder Mfg. Co., Phila., Pa. 418
R. D. Wood & Co., Phila., Pa. 434
Wm. M. Crane & Co., New York City. 418

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Co., New York City. 434
Continental Iron Works, Brooklyn, N.Y. 434
G. Shepard Page's Sons, New York City. 435
Logan Iron Works, Brooklyn, N. Y. 436
R. D. Wood & Co., Phila., Pa. 434

CEMENTS.

C. L. Gerould & Co., Mount Vernon, N.Y. 430

RETORTS AND FIREBRICKS.

J. H. Gautier & Co., Jersey City, N. J. 430
B. Kreischer & Sons, New York City. 430
Adam Weber, New York City. 430
Laclede Firebrick Mfg. Co., St. Louis, Mo. 430
Cyrus Borgner, Phila., Pa. 430
James Gardner, Jr., Pittsburgh, Pa. 430
Henry Maurer & Son, New York City. 430
Baltimore Retort and Firebrick Co., Baltimore, Md. 430
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. 430
Brooklyn Firebrick Works, Brooklyn, N. Y. 430
F. Behrend, New York City. 419

INCANDESCENT GAS LAMPS.

Welsbach Commercial Co., Phila., Pa. 424

THORIUM.

The Roessler & Hasslacher Chemical Co., N.Y. City. 417

MICA GOODS.

The Mica Mfg. Co., New York City. 417

BURNERS.

C. A. Gefrorer, Phila., Pa. 434
Theo. Clough, Dobbs Ferry, N. Y. 417
Wm. M. Crane & Co., New York City 418

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn. 418

GAS BAGS.

Peerless Rubber Mfg. Co., New York City. 417

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 427
Greenpoint Chemical Works, Brooklyn, N.Y. 427
Henry W. Douglas, Ann Arbor, Mich 427

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind 421
Isbell-Porter Company, New York City. 434
Connelly Iron Sponge and Governor Co., New York City 427

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y. 426
Chapman Valve Manufacturing Co., Boston, Mass. 426
R. D. Wood & Co., Phila., Pa. 434
Continental Iron Works, Brooklyn, N. Y. 434
The P. H. & F. M. Roots Co., Connersville, Ind. 421
Isbell-Porter Co., New York City. 434
The Western Gas Construction Co., Fort Wayne, Ind. . . . 426

ELECTRICAL APPARATUS.

Wm. Henry White, New York City 435

GAS ENGINES.

Otto Gas Engine Works, Phila., Pa. 440
The American Gas Engine Co., Phila., Pa. 431
Backus Water Motor Co., Newark, N. J. 416

ENGINES AND BOILERS.

The Hazelton Boiler Company, New York City. 417
W. G. & G. Greenfield, East Newark, N. J. 417

PURIFIER SCREENS.

John Cabot, New York City. 418

GAS STOVES.

American Meter Co., New York and Philadelphia 423
Maryland Meter and Manufacturing Co., Baltimore, Md. 438
Keystone Meter Co., Royersford, Pa. 438
Wm. M. Crane & Co., New York City. 418

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N. Y 426

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md. 433
Continental Iron Works, Brooklyn, N. Y. 434
Deily & Fowler, Philadelphia, Pa. 436
Davis & Farnum Mfg. Co., Waltham, Mass. 432
Kerr Murray Mfg. Co., Fort Wayne, Ind. 432
Stacey Mfg. Co., Cincinnati, Ohio. 435
R. D. Wood & Co., Philadelphia, Pa. 434
Logan Iron Works, Brooklyn, N. Y. 436
Riter & Conley, Pittsburgh, Pa. 419

GAS SECURITIES.

Marquand & Parmly, New York City. 417

DIVIDEND NOTICE.

OFFICE OF WELSBACH LIGHT CO.,
DREXEL BUILDING, PHILA., Sept. 8, 1897.

The Directors have this day declared a dividend of One Dollar per share, payable Sept. 18, 1897, to stockholders of record at the close of business Sept. 11th. Checks will be mailed.

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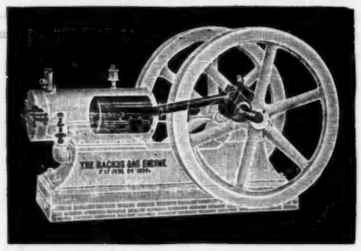

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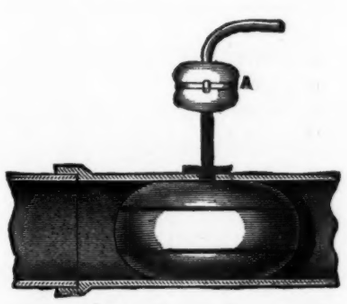

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5 " " "	1.05		20 " " "		12.00
6 " " "	1.75		24 " " "		17.00
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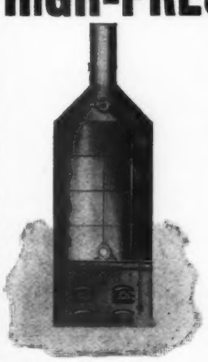

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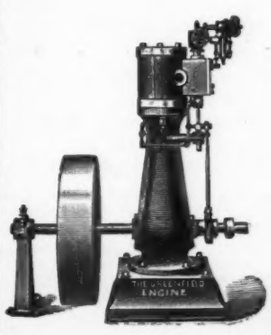

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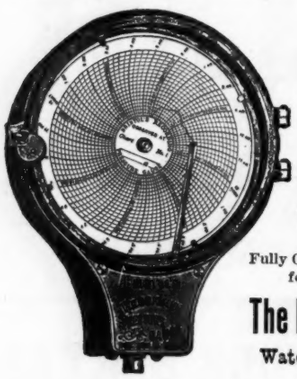

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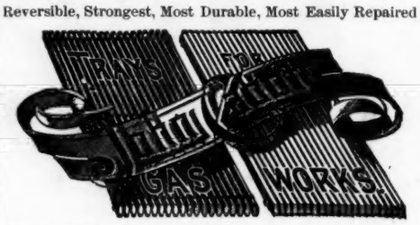

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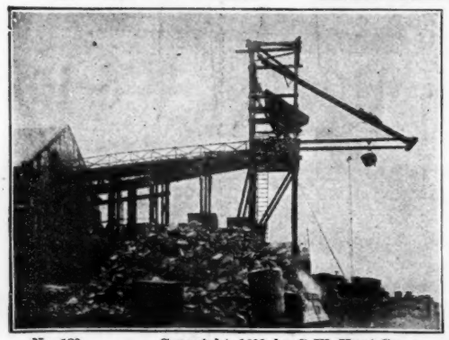

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The Patentees of the above, after several years' experience, finding that the enormous weight of the iron sheets (forming the washing discs) caused undue wear of the shafts and consequent fractures of the latter, introduced their Patent Wooden "Grid Segments." These "segments" have now been fitted in some hundreds of Patent "Standard" Washer-Scrubbers, and are universally admitted to be a great improvement upon the out of date pattern.

The Patentees beg to refer Engineers to recent issues of the AMERICAN GAS LIGHT JOURNAL for testimonials as to the efficiency of their improvements and will be glad to quote for complete machines or for "grid segments" for fitting in old pattern Washer-Scrubbers, the manufacture to be English or American at enquirer's option. If for any *special reason* iron sheets are preferred, the Patentees will quote for them, but they do not recommend same.

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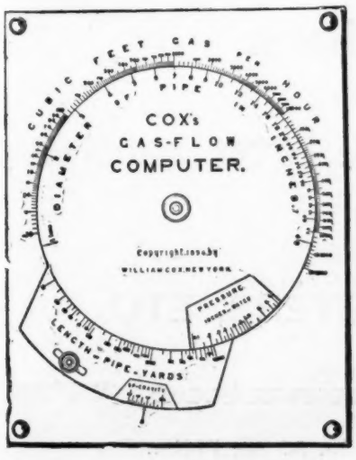

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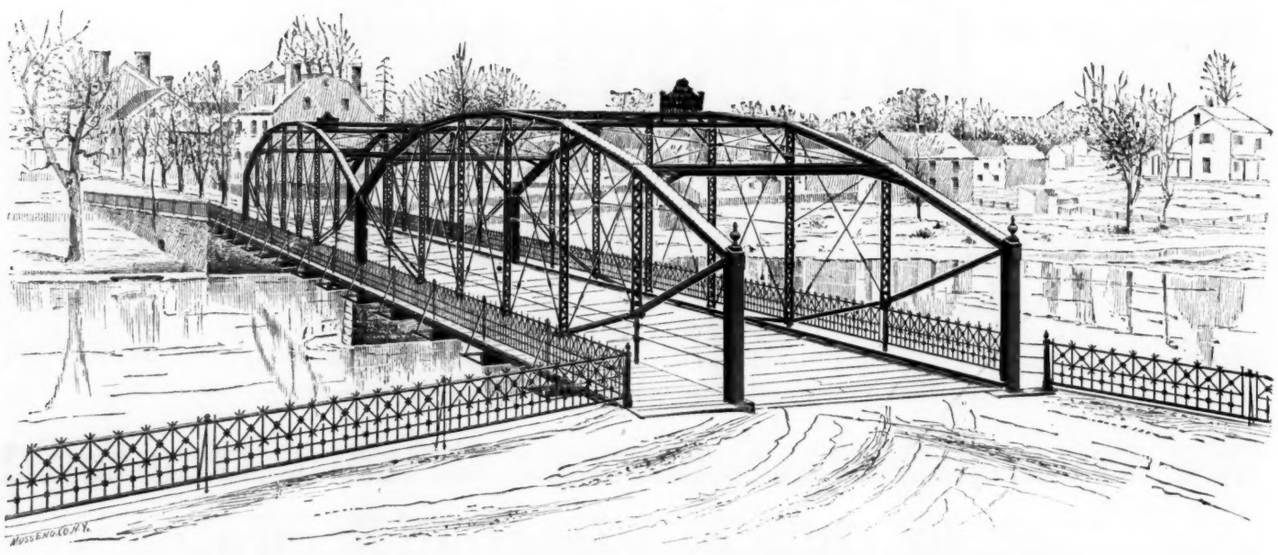

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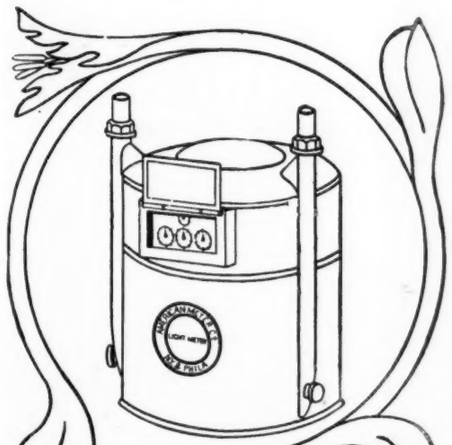

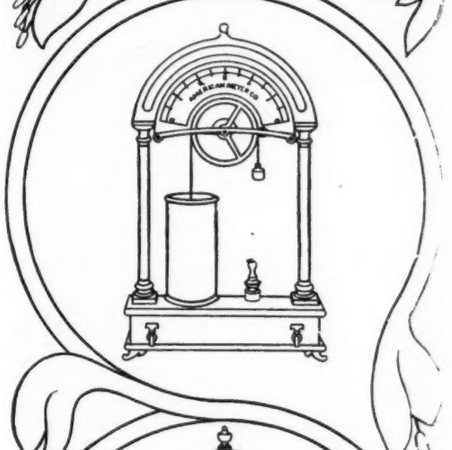

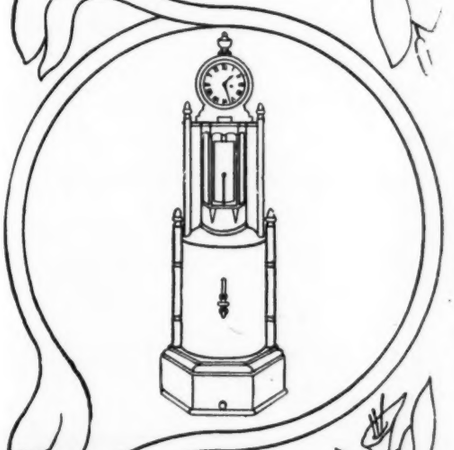

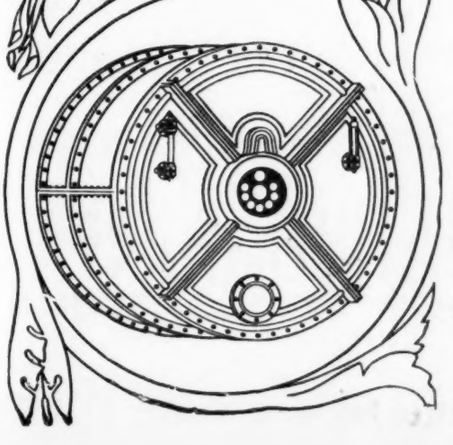

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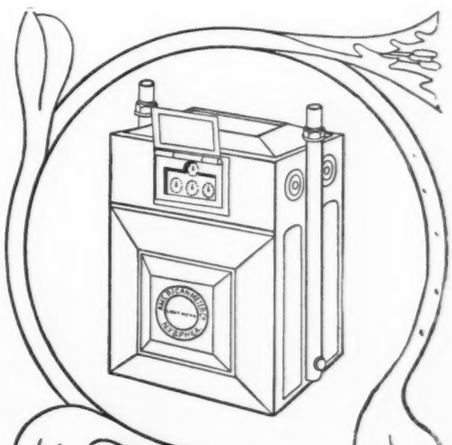
PUBLIC LIGHTING TABLE.

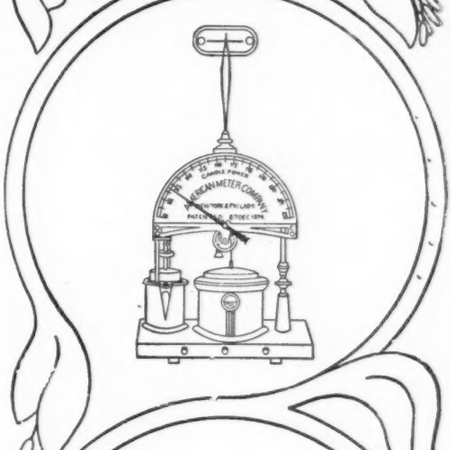
SEPTEMBER, 1897.

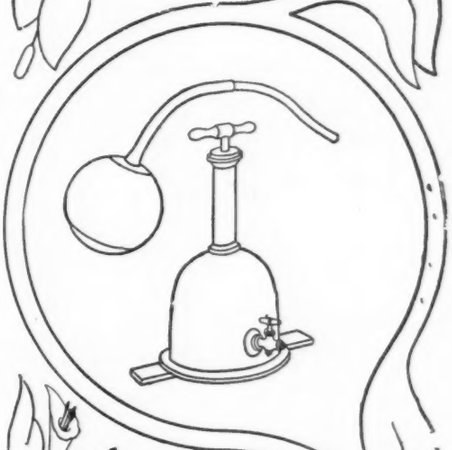
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extingnish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Wed.	1	7.40 PM	4.30 AM	6.30	4.20
Thu.	2	8.20	4.30	6.30	4.20
Fri.	3	9 10 FQ	4.30	6.15	4.30
Sat.	4	10.20	4.30	6.15	4.30
Sun.	5	11.20	4.30	6.15	4.30
Mon.	6	12.40 AM	4.30	6.15	4.30
Tue.	7	1.50	4.30	6.15	4.30
Wed.	8	3.00	4.30	6.15	4.30
Thu.	9	No L.	No L.	6.15	4.30
Fri.	10	No L. FM	No L.	6.05	4.40
Sat.	11	No L.	No L.	6.05	4.40
Sun.	12	6.40 PM	7.40 PM	6.05	4.40
Mon.	13	6.40	8.00	6.05	4.40
Tue.	14	6.40	8.30	6.05	4.40
Wed.	15	6.40	9.00	6.05	4.40
Thu.	16	6.40	9.40	6.05	4.40
Fri.	17	6.40	10.20	5.55	4.50
Sat.	18	6.40 LQ	11.10	5.55	4.50
Sun.	19	6.30	12.10 AM	5.55	4.50
Mon.	20	6.30	1.10	5.55	4.50
Tue.	21	6.30	2.20	5.55	4.50
Wed.	22	6.30	3.20	5.55	4.50
Thu.	23	6.30	4.50	5.55	4.50
Fri.	24	6.30	4.50	5.40	5.00
Sat.	25	6.30	4.50	5.40	5.00
Sun.	26	6.20 NM	5.00	5.40	5.00
Mon.	27	6.20	5.00	5.40	5.00
Tue.	28	6.20	5.00	5.40	5.00
Wed.	29	6.20	5.00	5.40	5.00
Thu.	30	6.20	5.00	5.40	5.00

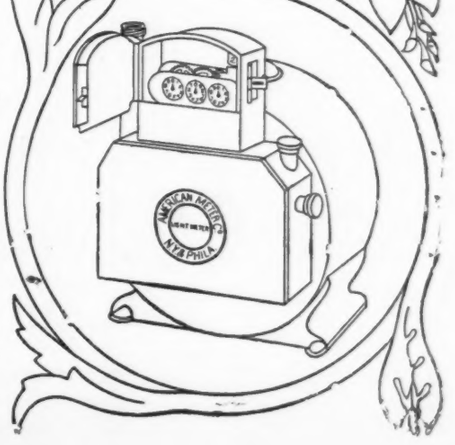
TOTAL HOURS LIGHTING DURING 1897.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	233.00	January	423.20
February	187.20	February	355 25
March	202.00	March	355.35
April	170.40	April	298.50
May	163.00	May	264.50
June	140.40	June	234.25
July	151.40	July	243.45
August	167.30	August	280.25
September	174.40	September	321.15
October	200.00	October	374.30
November	205.20	November	401.40
December	220.10	December	433.45
Total, yr.	2216.00	Total, yr.	3987.45









To Whom It May Concern.

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NOTICE is hereby given to all PURCHASERS and USERS of the so-called "Sunlight" lamp that suits will be brought against them for DAMAGES for INFRINGEMENT of the Letters Patent of the Welsbach Light Company, and will be prosecuted vigorously.

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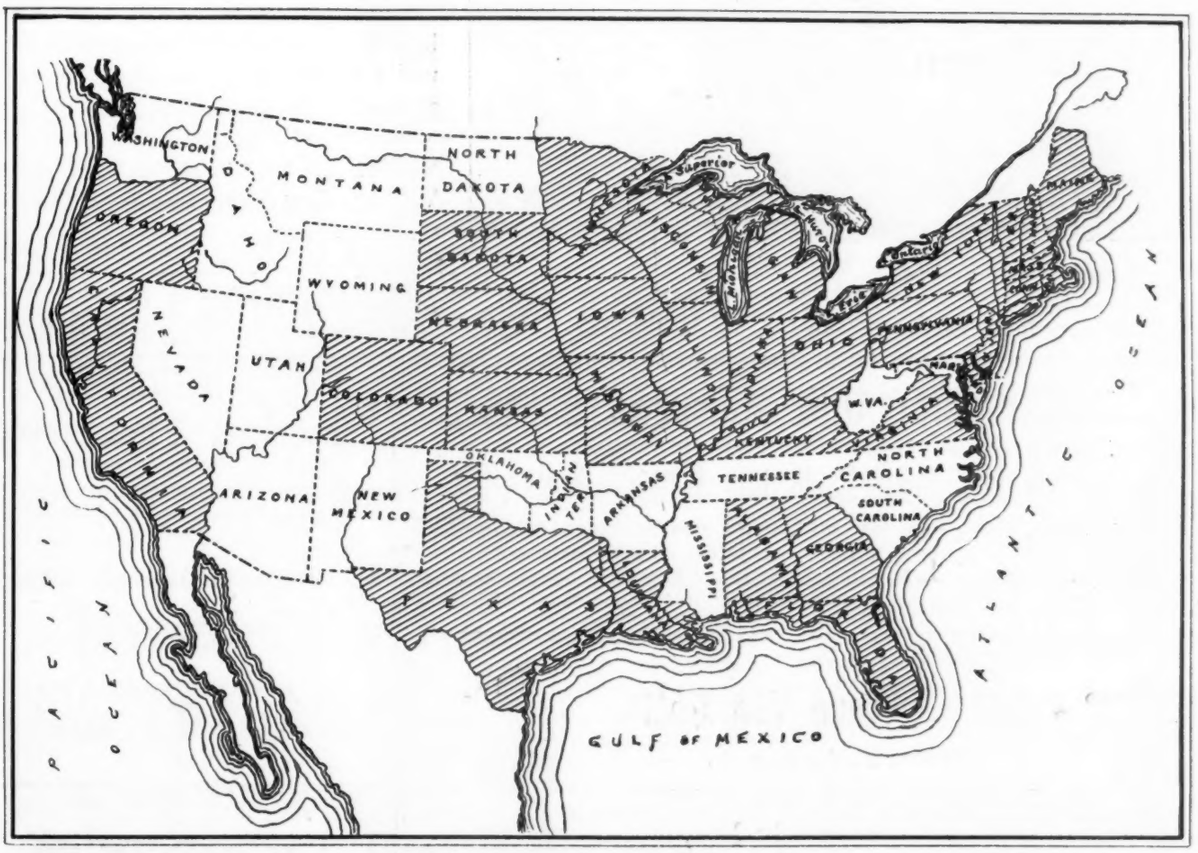

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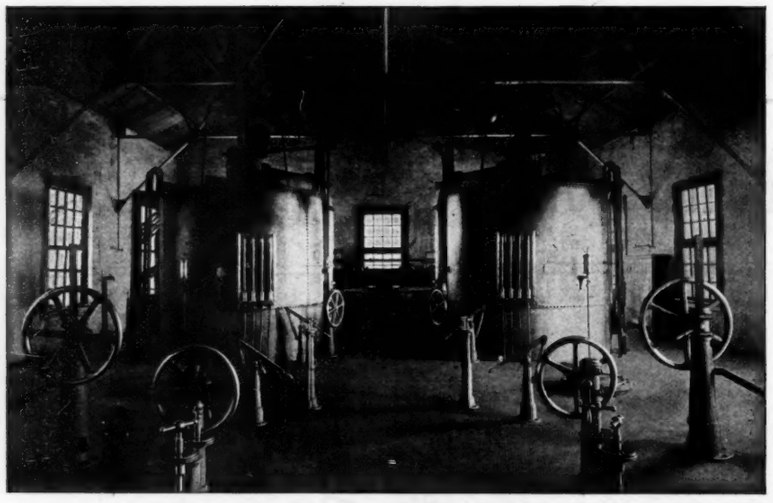

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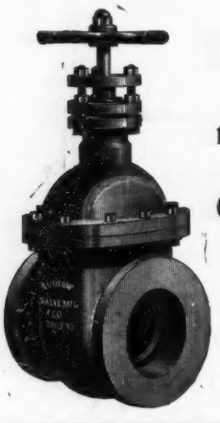

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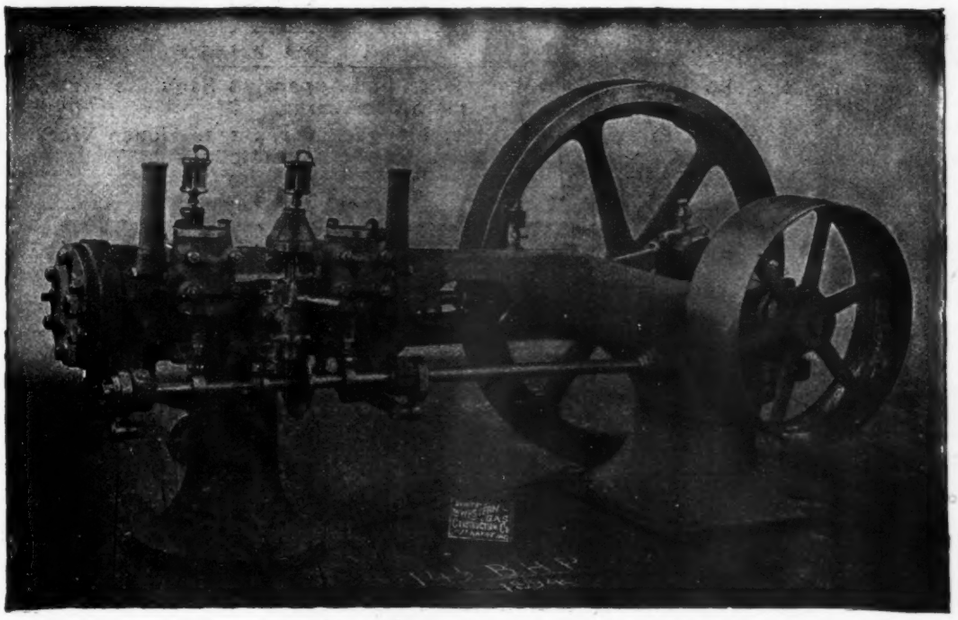

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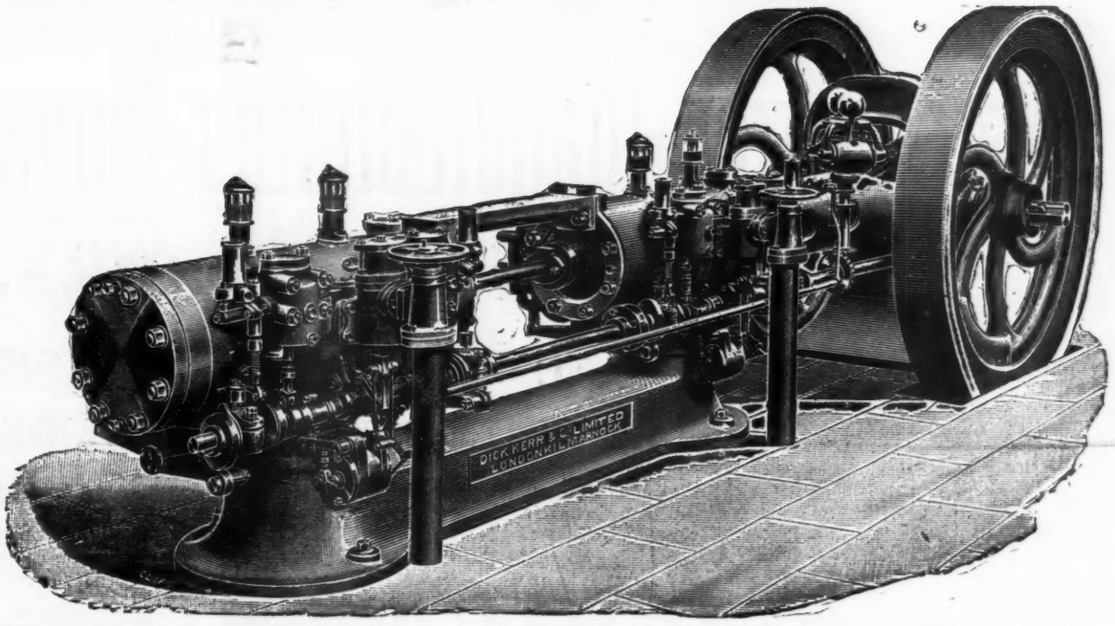

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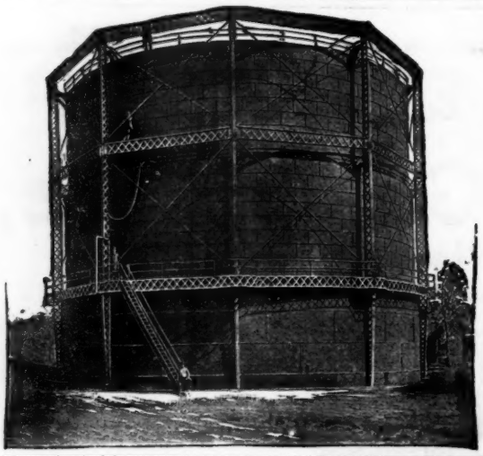

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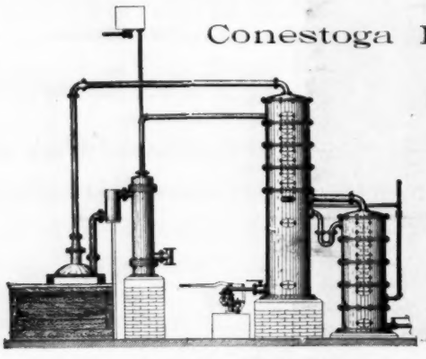

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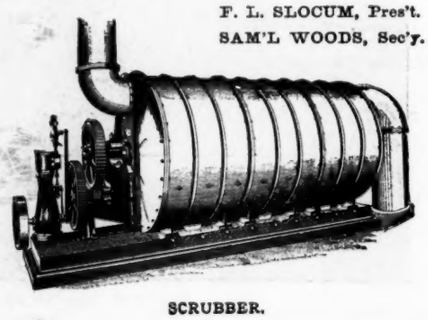

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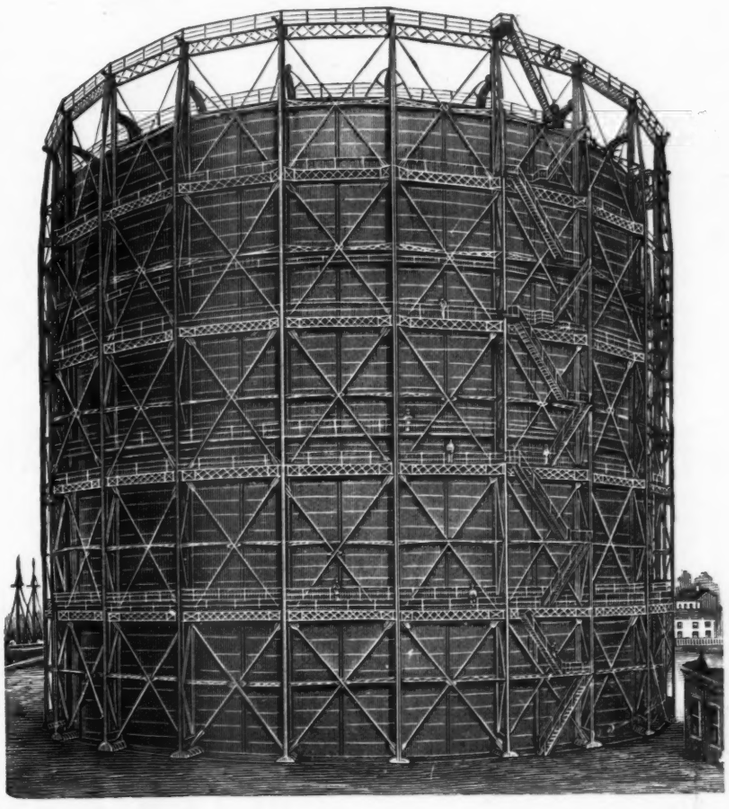

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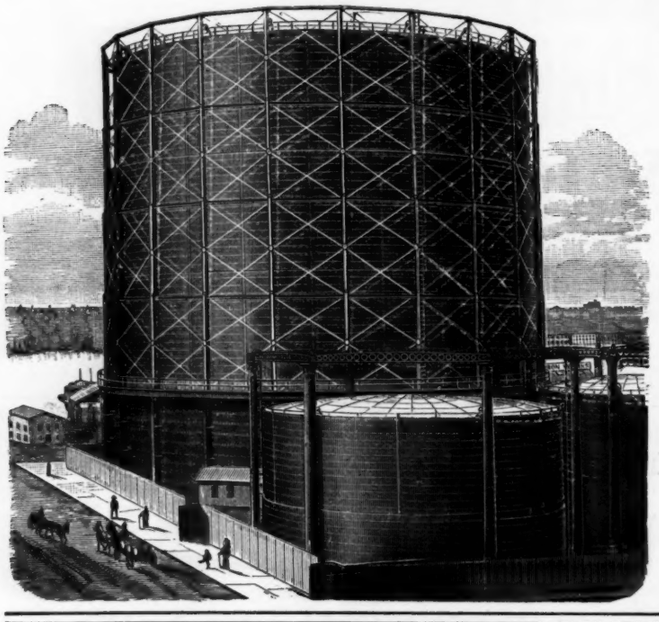

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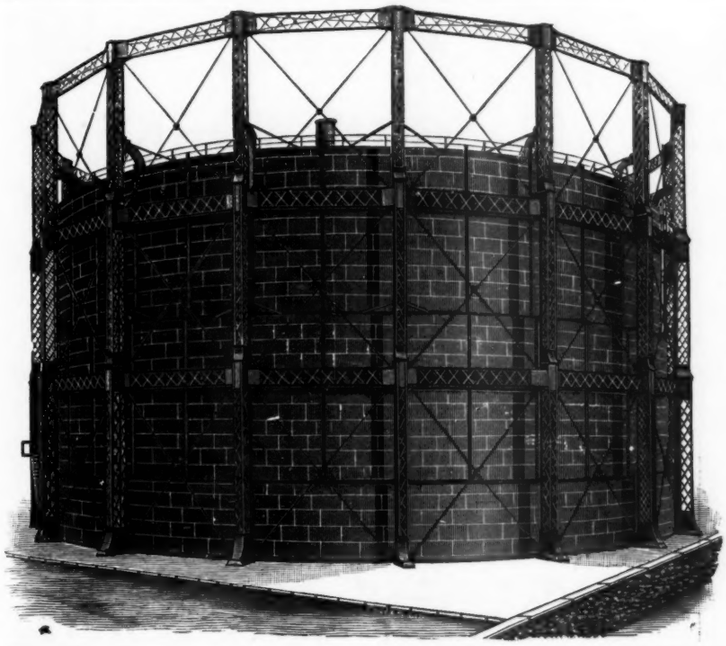

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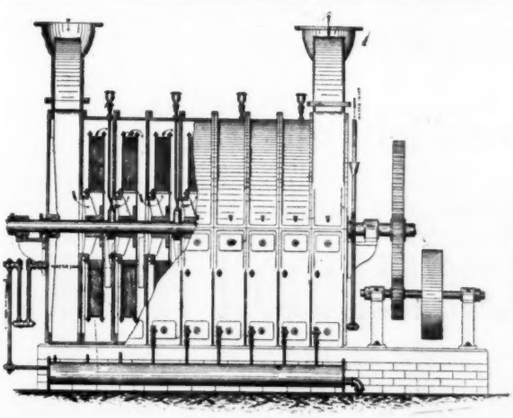

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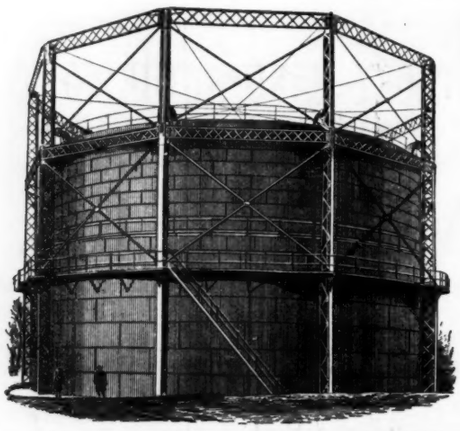

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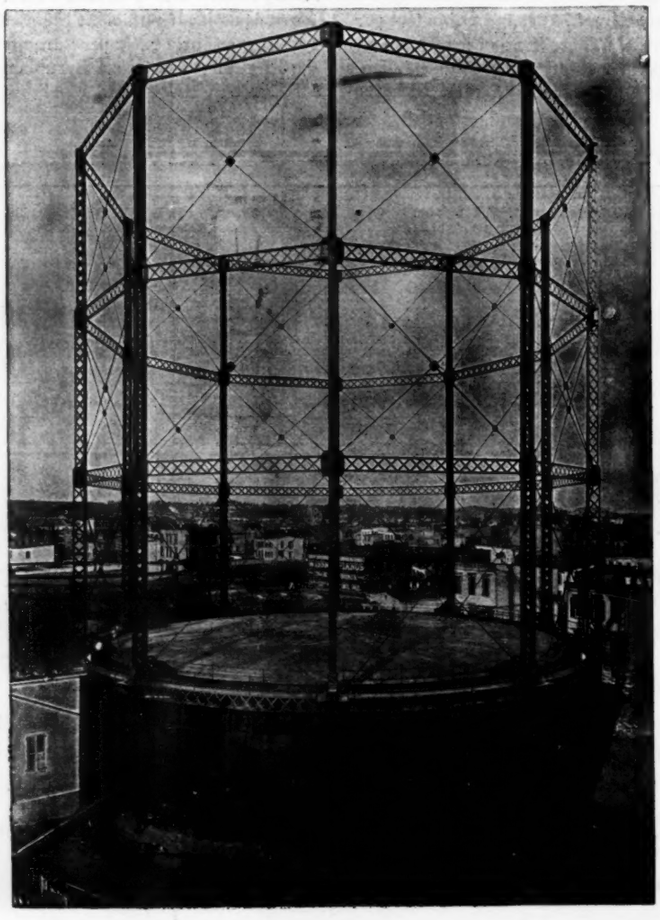

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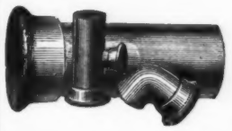

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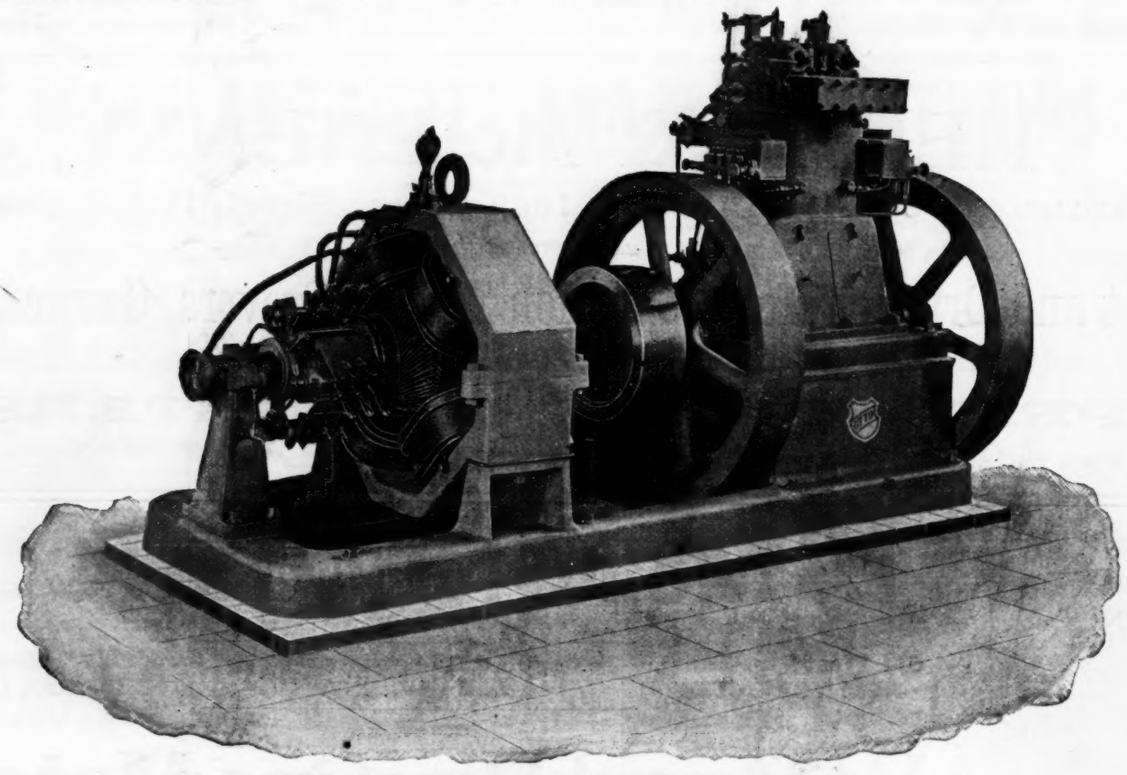

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